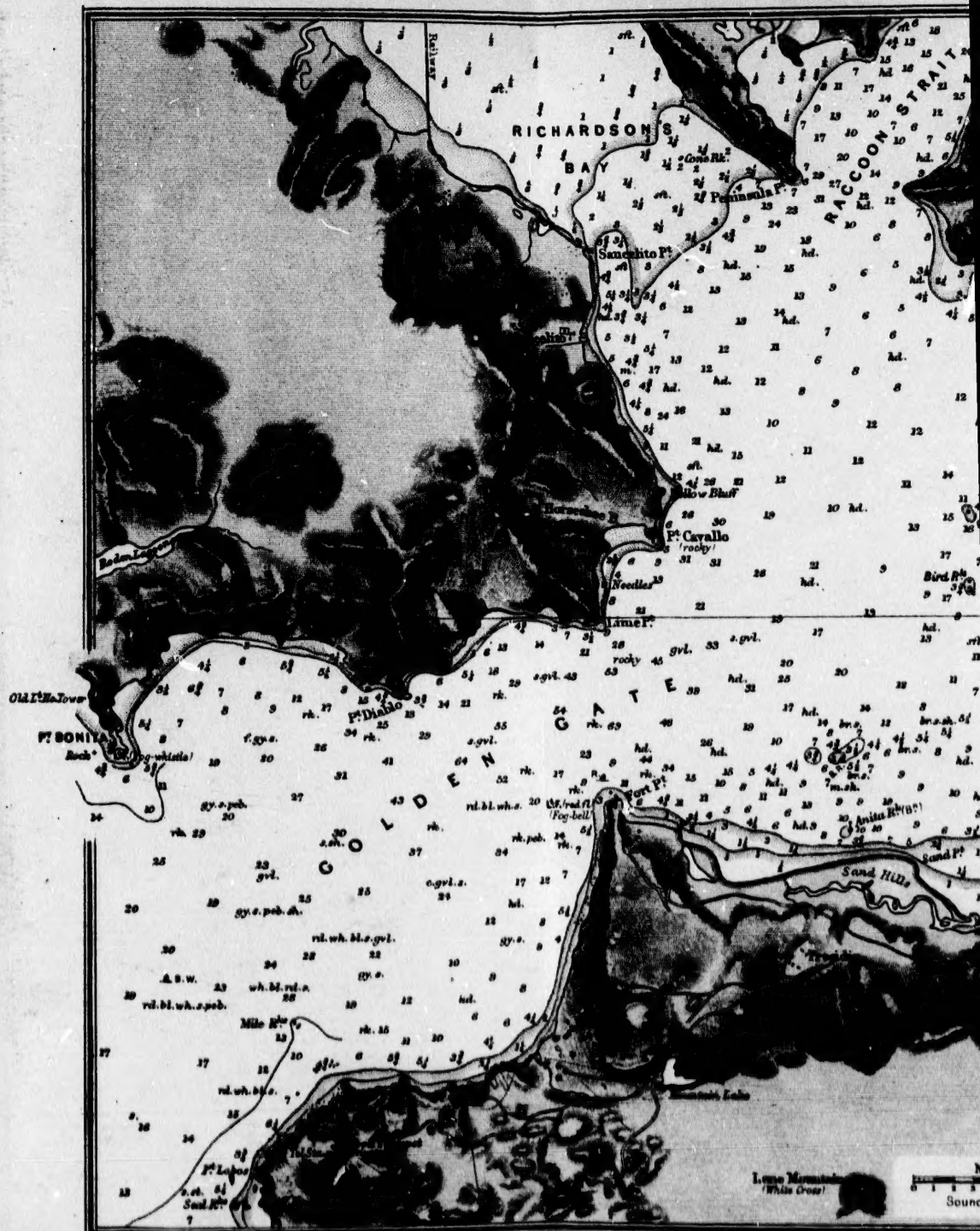
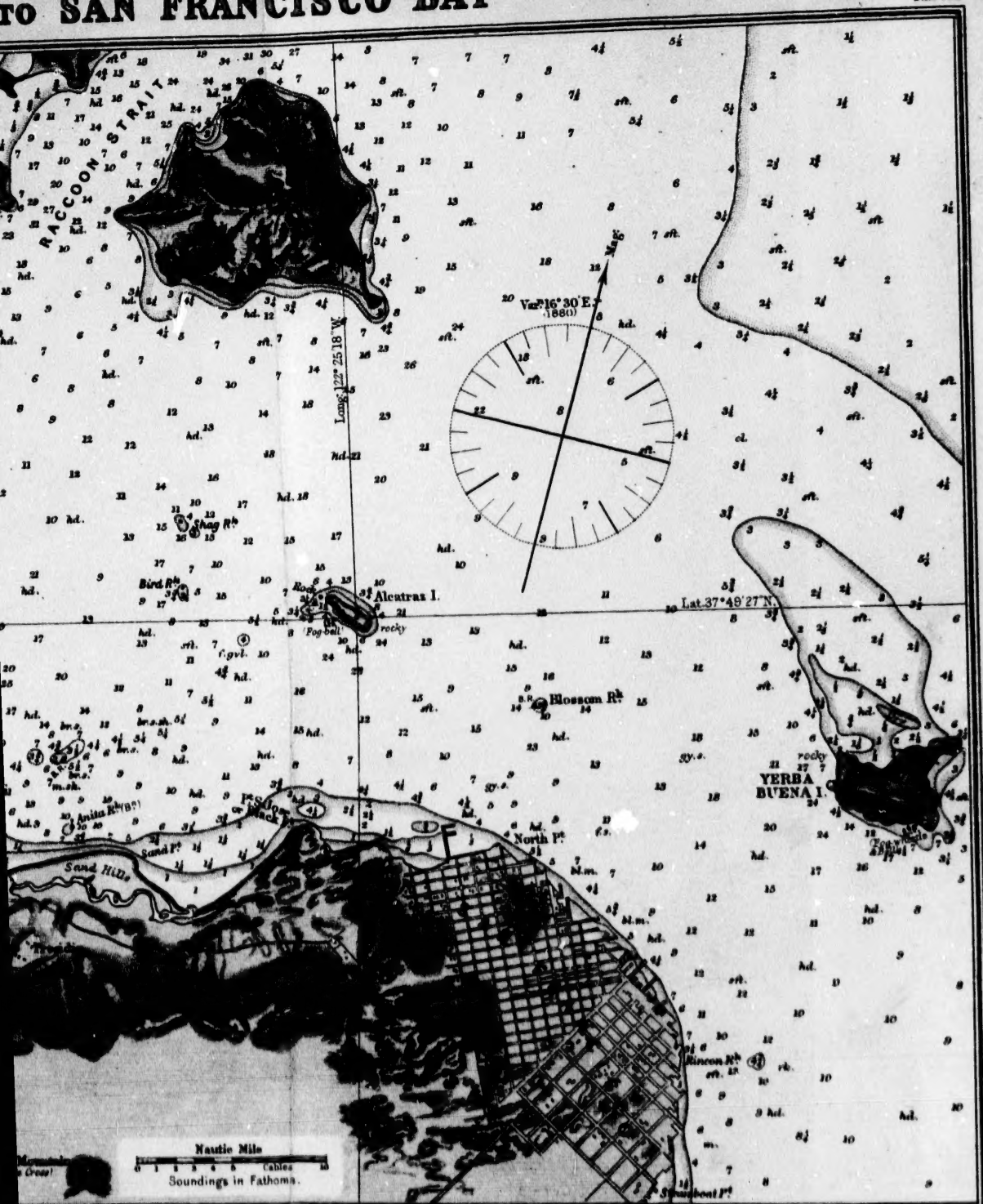


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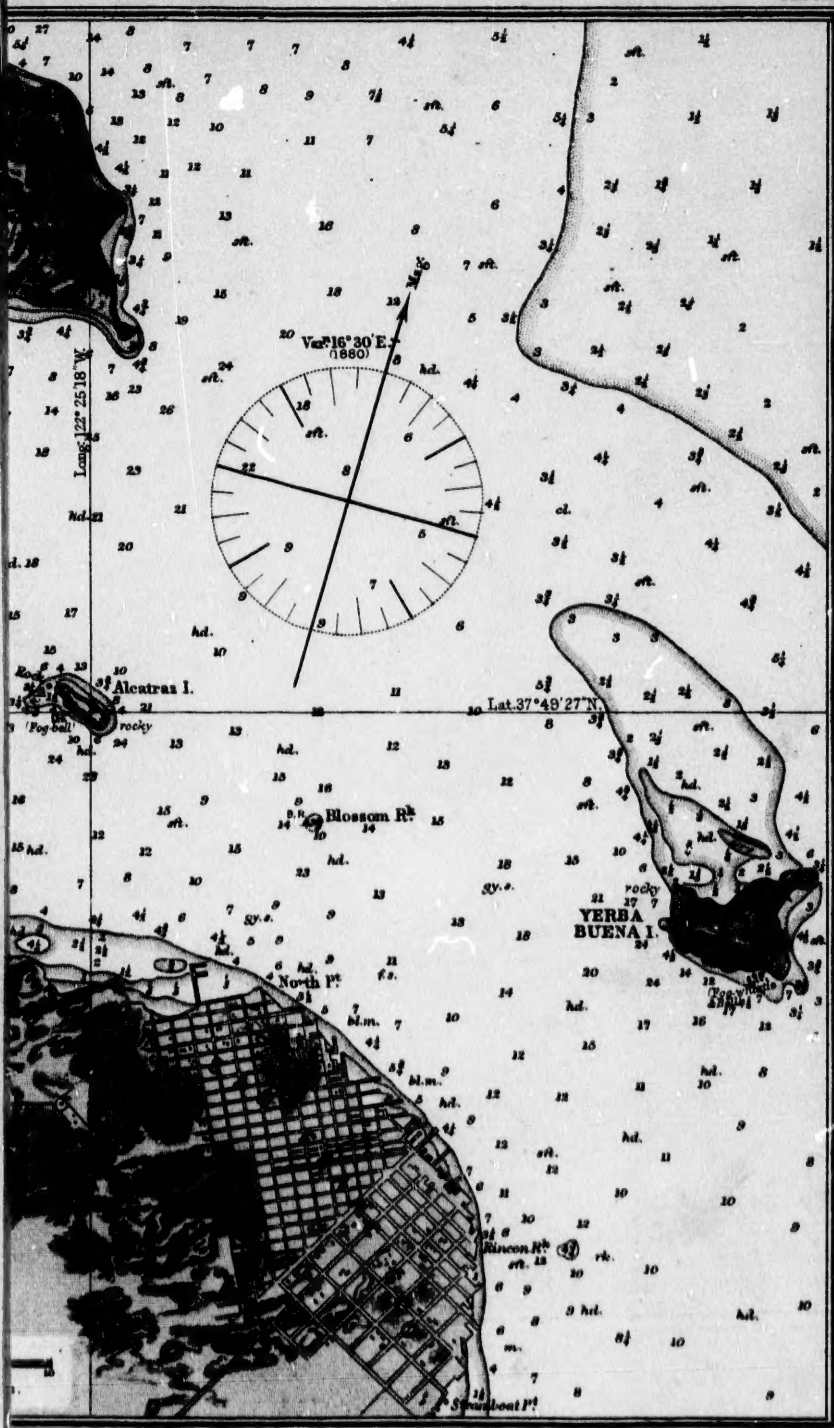
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NORTH PACIFIC PILOT: PART I.

THE
WEST COAST
OF
NORTH AMERICA,
BETWEEN
PANAMA AND QUEEN CHARLOTTE ISLANDS,
INCLUDING
PORT SIMPSON AND SITKA SOUND.

BY
JAMES F. IMRAY, F.R.G.S.



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PREFACE.

—o—

Since the publication of the first edition of this Work great and important changes—both political and commercial—have occurred on the western sea-board of the North American Continent; not only have vast territories passed into other hands and new boundaries been determined for various states, but the discovery of extensive “gold bearing” districts, which at first drew thither a large body of immigrants bound for the “diggings,” and who went there merely to search for the precious metals and for minerals, has finally resulted in the settlement of richly productive agricultural tracts; thus villages have become towns,—and towns, cities,—while the formerly unfrequented harbours and roadsteads have become marts of commerce to which the shipping of all nations resort,—and so, as regards navigation, calls for better and improved charts, and sailing directions.

The lack of information which rendered the first edition very incomplete can now no longer be pleaded. In the interval the different maritime nations have been emulous in the production of good surveys, and hence what formerly could only be presented to the Navigator in detached fragments, becomes a connected description of the entire coast from Panama to Queen Charlotte islands,—not so perfect as a continually increasing commerce may ultimately demand, but still sufficient for its present exigencies. The deficiencies will be supplied as opportunity offers, as new ports are opened, and as the increasing traffic of the older ports improves,—as changes resulting alike from physical and human causes occur.

The present (third) edition of this Work has been enlarged, revised and corrected up to date by Mr. Henry D. Jenkins.

J. F. I.

Dec. 1880.

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The following are some of the publications consulted in the compilation of this Work:—

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LIGHTS.

The following is a complete list of the Lights shown at this date, December 1st, 1880, within the limits of the Navigation described in this work. As a full description of them is given in the pages mentioned, it is unnecessary to add more detailed particulars:—

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Ano Nuevo Island	Fog-whistle 206
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"	On Fort Point. <i>Fixed</i> (with red flashes); visible 15 miles. Fog-bell 210
"	Alcatraz island. <i>Fixed</i> ; visible 14 miles. Fog-bell 211

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ADDENDA.

During the progress of this Work through the press the following corrections and additions became necessary:—

LEON.—The population of the city of Leon is about 85,000 not 8500 as given in text. Page 60.

LA UNION.—The light at La Union, San Salvador, is located on the end of the wharf, and not on the Commandant's house. Page 65.

AMAPALA.—A white buoy now guards the shoal situated 4 cables north-west of the north-west point of Tigre island. Page 68.

LEMPA SHOAL.—The following information relating to a shoal on the coast of Salvador, known as Lempa shoal, and considered doubtful as regards its position, has been received by the U.S. Hydrographic Office from Commander J. W. Philip, U.S.N., commanding U.S.S. *Tuscarora*, (1880):—

This shoal (centre) lies in lat. $18^{\circ} 7'$ and long. $88^{\circ} 80'$, and forms a bar off the mouth of Jigüileco bay. It extends in the form of a horse-shoe across the mouth of the bay, from side to side, and its outer edge or bend lies about 4 miles from the beach. At high water in calm weather, or with light breezes, the bar is perfectly smooth; but at all other times the sea breaks heavily all over the shoal.

The following bearings were taken from the *Tuscarora* just outside the breakers:—San Miguel volcano N. 26° E.; San Vicente volcano N. 48° W.; San Salvador volcano N. 55° W. Page 69.

MAZATLAN.—A lighthouse has recently been erected on Creston island at the entrance to the bay of Mazatlan; it exhibits a *fixed white* light, visible 20 miles. Its approximate geographical position is lat. $28^{\circ} 10' 36''$, long. $106^{\circ} 27'$. Page 118.

ANO NUEVO ISLAND.—The fog-signal at Ano Nuevo island, in lat. $87^{\circ} 8' 42''$, long. $122^{\circ} 19' 51''$ has been altered in character. In future it will give a blast of 10 seconds duration, followed by an interval of 55 seconds. Page 206.

SOUTH FARALLON.—A steam-siren has been established at a station about 200 yards S. 81° E. from the lighthouse on South Farallon. During fog it will be sounded for 5 seconds at intervals of 45 seconds. Page 220.

TIMBER GULCH.—Commander W. Coffin, U.S.S. *Hassler*, reports a dangerous patch of foul ground off the entrance of Timber gulch, $2\frac{1}{2}$ miles E.S.E. of fort Ross, California.

The patch lies from one-half to three-quarters of a mile from the shore, and contains

* According to this longitude of the shoal, the approximate position of Port Jigüileco given in text is about 12 minutes too far east.

several rocky heads—one nearly awash at low water, others with from 8 to 15 feet water, with 4 to 6 fathoms between them, and 9 fathoms close at hand, outside. At the time of the survey, October 1879, *kelp*, extending out from the shore, covered the westernmost half of the patch. It is not often these rocks are marked by breakers, their area being small.

Thirty fathoms of water are occasionally found in this vicinity within half a mile of the rocks, and it is dangerous for vessels coasting to pass inside that depth. Page 229.

YAUQUINA POINT.—The latitude of Yaquina point lighthouse given in text is *incorrect*; according to the latest U.S. List of Lights it should be $44^{\circ} 48' 30''$. Page 245.

COLUMBIA RIVER.—The following information as to the state of the Columbia river bar is furnished by Lloyd's Agents at Portland, Oregon, under date April 29th 1880, in consequence of a report having got abroad that the bar is shoaling:—There are always 25 feet at high water at this time, upon the shoalest parts of the bar of the South channel; and the bar being smooth, a vessel drawing $22\frac{1}{2}$ feet can cross out. This channel has been shoaling a little; but these shoal areas, arising from sand lumps of recent deposit, must wash out in the month of June, when the Columbia river will be much swollen, or a new opening must be formed, somewhat to the northward and westward of the present outlet. It is in consequence of this shoaling that the North channel has been used more, pilots preferring to cross in smooth water the shoal eastward of Sand island rather than cross the more exposed parts at the entrance of the South channel. The South channel is crooked, and a vessel is much longer in going out than by the North channel.

In the inside of the North channel there are always 22 feet at high water in the shoalest parts across the shoal east of Sand island, but during spring tides this depth is increased to from $22\frac{1}{2}$ feet to 23 feet. To the north-eastward of this shoal to cape Disappointment, following the line of the channel, there are from 26 feet to 28 feet. Farther seaward, along this channel, the water deepens rapidly to from 30 to 35 feet, until the bar proper is crossed.

Note.—The latitudes of the lighthouses on point Adams and cape Disappointment given in text are *uncertain*; according to the latest (1880) U.S. List of Lights the lat. of point Adams lighthouse is $46^{\circ} 11' 36''$ and of cape Disappointment lighthouse $46^{\circ} 18' 38''$. Page 258.

ESQUIMALT HARBOUR.—Thetis cottage, one of the objects forming the leading mark for entering Esquimalt harbour, has been demolished during recent heavy falls of snow. As a substitute a wooden beacon has been erected on Dyke point; it is 23 feet above high water, pyramidal in shape and painted *white*.

Note.—Dyke point beacon just open of, or in line with, the Western Inskip rock, bearing N. by W. $\frac{1}{2}$ W., leads in mid-channel to Esquimalt harbour. Page 291.

December 1st, 1880.

U.S. BUOYAGE.

In conformity to the terms of the Act of Congress approved September 28th, 1850, prescribing the manner of colouring and numbering the buoys along the coasts and in the bays, sounds, rivers, and harbours of the United States, the following order must be observed, viz. :—

1. In approaching the channel, &c., from seaward, *red* buoys, with *even numbers*, will be found on the *starboard* side of the channel, and must be left on the *starboard* hand in passing in.

2. In approaching the channel, &c., from seaward, *black* buoys, with *odd numbers*, will be found on the *port* side of the channel, and must be left on the *port* hand in passing in.

3. Buoys painted with *red* and *black horizontal stripes* will be found on obstructions, with channel ways on either side of them, and may be left on either side in passing in.

4. Buoys painted with *white* and *black perpendicular stripes* will be found in *mid-channel*, and must be passed close-to, to avoid danger.

5. All other distinguishing marks to buoys will be in addition to the foregoing, and may be employed to mark particular spots.

6. Perches, with balls, cages, &c., will, when placed on buoys, be at turning points, the colour and number indicating on what side they shall be passed.

SAILING DIRECTIONS

FOR THE

WEST COAST

OF

NORTH AMERICA.

*** *The Bearings and Courses throughout this Work are Magnetic. The Depths are those at low water spring tides. The Distances are in Nautical miles of 60 to a Degree of Latitude. The Nautical Mile is about 6086 English feet, usually reckoned as 6000=2000 yards=1000 fathoms: also the Nautical Mile=1855 metres=1·855 kilometres.*

N.B.—As the Latitudes in this work are North of the Equator, and the Longitudes are West of Greenwich, the distinctive letters N. and W. are emitted.

GENERAL REMARKS ON CENTRAL AMERICA.

Central America includes all the territory lying between Mexico on the north, and the isthmus of Panama, on the south. In length 700 miles, and of very variable breadth, it nevertheless contains 164,900 English square miles. It has a population of about 2,600,000, about a quarter of whom are whites (creoles of European parentage), the remainder Indians and Mestizoes, of mixed descent. Situated in the torrid zone, between latitudes 8° and 18°, longitudes 81½° and 98°, it at once separates the Atlantic from the Pacific ocean, and unites the continents of North and South America; a position as important commercially, as it is geographically remarkable and unique.

It includes the independent states of Guatemala, San Salvador, Honduras, Nicaragua,* and Costa Rica, with the British colony of Belize, or British Honduras. It is bounded on the north by Mexico; on the south-west by the Pacific; and on the east by the Caribbean sea, and the bay of Honduras.

* The Mosquito territory, formerly under British protection, is now included in the state of Nicaragua.

The five states of Central America nearly correspond, at the present time, with the "Intendencias," as they existed under Spanish Colonial rule. Their boundaries are pretty clearly defined, and vary but little. They are subdivided into departments, and districts; the latter applying to the less peopled, though often extensive tracts, covered with almost impenetrable forests.

The State of Guatemala includes a considerable and populous highland district to the south and west, while to the northward, vast territories, such as those of Vera Paz and El Peten, are but thinly inhabited. It has the largest population (nearly 1,200,000), and far surpasses the other states in importance. Its trade, which is considerable, is almost entirely confined to its port in the gulf of Honduras on the Atlantic side. The principal port on the Pacific coast is San Jose de Guatemala, which is an open roadstead of some importance. The exports are numerous, consisting chiefly of cotton, wheat, cocoa, sugar, coffee, indigo, metals, mahogany, and cochineal. In 1878 the imports amounted to £619,000, and the exports to £900,000. Great efforts are being made to improve the agricultural resources of the country, which are naturally wonderfully rich, yet the wheat crop of 1878 failed, and the Government was forced to reduce the duty on imported grain by one-half. Coffee cultivation is being largely extended, and liberal terms are offered to immigrants to settle in the country and introduce permanent improvements in the way of irrigation works, roads, &c. Attempts are being made to open the oil deposits on the Atlantic coast in the neighbourhood of the Lampara and St. Vincent rivers.

New Guatemala, the capital, is in lat. 14° 41', long. 90° 36'; the old city was abandoned on account of earthquakes. New Guatemala, though a comparatively mean looking place of one storied houses, may on many accounts be considered as the principal town in Central America. It is situated on the border of one of the elevated plateaux of the main Cordillera, known as *Los Llanos de las Vacas*, (the valley of *Harmita*). This plain is surrounded by bold ranges of mountains, among which stand prominent the two lofty volcanoes of *Agua* and *Fuego*, and a third known as *El Volcan de Pacaya*, which is scarcely, if at all, inferior to them. The plain is about 5000 feet above the level of the sea, and is 15 miles wide and 18 broad. The climate, though considered inferior to that of Antigua or old Guatemala, is mild and salubrious. The thermometer rarely rises above 70° Fahr., and still more rarely descends below 64°. The number of inhabitants, who are chiefly Ladinos, the mixed or Mestizo race, and pure Creole Spaniards, the unmixed descendants of Spanish colonists, is estimated at 40,000; and in importance and wealth, it is second, in Spanish America, only to the city of Mexico.

The State of San Salvador is situated on the western coast. Its climate is hot, but more healthy than that on the eastern shores—perhaps because the land is better cleared and cultivated. The chief products of this state are indigo, coffee, sugar, and tobacco. The city of San Salvador, its capital, only a few miles distant from the Pacific ocean, was nearly destroyed by an earthquake in 1854, prior to which it contained 20,000 inhabitants; but it is now reviving; during a short period it was the seat of the Federal Union, and like Washington, it had at that time a certain territory around the city, distinguished as the Federal District. Cojutepeque is an important

town with 15,000 inhabitants, and Sonsonate with 10,000 inhabitants is famous for its distilleries. The principal seaports are La Union, Acajutla, and Libertad; the first named is a fine harbour, but the others are mere open roadsteads. In 1876 the imports amounted to £721,005, and the exports to £378,817.

The State of Honduras takes its name from the bay of Honduras, (signifying *depths*), which forms its northern boundary. The first navigators so denominated it, because they with difficulty obtained soundings in it. The surface of the ground is, in this state, even more generally uneven than elsewhere. Its population is scanty in comparison with the two former states; and, like Guatemala, it still comprises vast districts of virgin forests, partially peopled by Indians. The climate, like that of the other states, is varied, being generally temperate in the interior, which is notable for its mines,—and hot near the coasts, which abound with rivers, from the banks of which much mahogany and sarsaparilla are obtained. Comayagua (formerly Valladolid), the capital, is a city of some importance, with 8,000 inhabitants. This state possesses two sea-ports, Truxillo and Omoa, which were active as military and commercial depôts of Spain, but are now fallen into comparative decay. Tegucigalpa has gold, silver and copper mines in its vicinity.

The State of Nicaragua is exceedingly fertile, and generally salubrious; but, notwithstanding its possessing several advantages over Honduras, it is but little more populous. This may partly be accounted for by the absence of any leading branch of industry, or any considerable activity in its commerce, but still more by its frequent civil wars. In a land surpassingly volcanic, this state is pre-eminently so. Managua, possessing a population variously stated between 6,000 and 12,000, is the present (1878) capital and seat of Government; but Leon, the former capital, with an estimated population of 25,000, is the largest city. These large cities once enjoyed great wealth and commercial prosperity; but, like all chief towns in Central America, they have suffered much from crime and consequent internal disorganization, as well as from civil wars, political commotions and misrule. They are now in consequence little better than ruins, scantily inhabited, and, where best, affording abundant evidence of both earlier and more recent devastations. Leon, between lake Managua and the Pacific, is said to have contained at one time 82,000 people. Granada, one of the oldest cities in Central America, has about 10,000 inhabitants; it is beautifully situated on the north-west shore of the lake Nicaragua. The town of Nicaragua, about 86 miles south-east of Granada, though inferior in size and importance, gives its name to the state and the lake. Like Granada, it is advantageously situated on its banks, opposite the populous island of Ometepe, which is in the lake, and contains an active volcano. Great interest at present attaches to this state and its waters, in connection with the long formed and often talked-of project of connecting the Atlantic and Pacific oceans at this point.

Costa Rica, the Central America state which at present enjoys the greatest degree of tranquility and political prosperity, lies to the southward of Nicaragua. Its isolated position on the narrower part of the isthmus of Panama, making communication with the other states difficult, has preserved it in a great measure from participating in the wars that have desolated the rest of the country; a circumstance which, conjointly

with a great accession of commercial vigour, arising out of the successful cultivation of coffee, has given it of late an impulse unknown to the sister states. It also yields gold, silver, tobacco, sarsaparilla, indigo, sugar, cocoa, and dye-woods, &c. While other large cities have been decaying, San Jose, its new capital, has risen into importance within a very few years, and already numbers upwards of 80,000 inhabitants. Cartago, the former capital, and two other towns of some magnitude (Heredia and Alajuela) occupy with the modern capital, an extensive table-land stretching almost across the isthmus. These towns, together with two or three small ports on each ocean, include almost the entire population (150,000) of this compact and thriving state.

Lakes.—The principal lake in Central America is that of Nicaragua, whose surplus waters descend to the Atlantic by the river San Juan del Norte. It is an inland sea 90 miles long N.W. to S.E., and about 40 miles broad. In many places the water is 10 to 15 fathoms deep, and it is stated that there are but few shallows. It contains a small archipelago of islands, and on one fertile and populous island, named Ometepe, there is a volcano. This lake is also connected with that called Managua, itself no inconsiderable body of water. The shores of these magnificent lakes, which are likely to afford important facilities for commerce, are of surpassing fertility, and as salubrious as they are beautiful. It is from the lake of Nicaragua that the canal is proposed to be cut, connecting the lake with the port of San Juan del Sur, on the Pacific.

Mountains.—Not far from the western or Pacific coast, the country is traversed from north-west to south-east by a continuous Cordillera or unbroken chain of mountains, unbroken at least as far as the lake of Nicaragua, which are covered with diversified vegetation. This forms a kind of connecting chain between the rocky mountains of the North, and the Andes of the South American continent. Some of the loftiest summits are 12,000 feet high. Frequent spurs or offsets from the "Sierra Madre," the main ridge, intersect the plains at right angles, and sometimes extend to the sea shore.

At various degrees of elevation along the sides and on the summits of the mountains are numerous plateaux or table-lands, like so many natural terraces, some of them of great extent, and all delightfully temperate and luxuriantly fertile. These regions especially seem to invite the residence of man, and to invite the culture of his hand. They constitute a distinguishing feature of this and some neighbouring countries. But none of these countries, and probably no part of the earth, presents a greater diversity of level on a surface of equal extent than does Central America; consequently, no country possesses such variety of climate, or offers such facilities of adaptation to all kinds of productions and to all constitutions of men, from the sun-burnt inhabitants of a tropical plain, to the hardy mountaineer inured to perpetual snows.

Most of the highest peaks and isolated mountains are volcanoes. The rocks are of granite, gneiss, and basalt; but volcannic formations and ejections predominate. Not less than thirty volcanic vents are said to be still in activity. The traces of remote, as well as recent earthquakes, are clearly discernible in the fissures and ravines that everywhere abound. Extinct craters, rent rocks, beds of lava, scorice, vitrified, charred, and pumice stones, together with hot and sulphureous springs, all mark it as the most volcanic region known. Indeed, shocks of earthquakes, generally slight, are periodically felt at the opening and closing of the wet season.

Products.—The productions of Central America are numerous. Abundant materials for exchange with other nations are afforded in cotton, coffee, sugar-cane, arrow-root, ginger, tobacco, and even silk worms, though but lately imported; but especially in "anil" (indigo), and "grana" (cochineal), which, because most lucrative, absorb almost all the attention of the planter. Other marketable productions are not wanting; but both known and unknown sources of wealth decay in the forests, or lie hidden beneath the soil. Besides these, the more temperate regions yield all, or nearly all, the productions which are raised in Europe. Wheat and barley are cultivated sometimes by the side of the sugar-cane, on the elevated plains; and the markets of the larger towns are supplied at once with the productions of torrid and of temperate climes; so that, at all seasons, the green pear, the cauliflower, and cos-lettuce, are sold along with the avocado-pear, olive, capsicum, or chillies, and many other productions of opposite climates, less delicate, perhaps, but more common and useful. Of edible fruits, those most common are the banana, pine-apple, orange, sweet lemon, lime, shaddock, water-melon, muskmelon, sapote, mango, guava, fig, tamarind, pomegranate, granadilla (fruit of the passion flower), sea-grape, papia, mamme, star and custard-apples, cocoa, cashew, and ground nuts. There are said to be in all "more than forty genera," including probably, those introduced from Europe, such as the apple, the pear, quince, cherry, &c., which, though they are found to thrive, are little appreciated, and none of any sort can be said to be cultivated with care. The same remark applies, though with frequent exceptions, to garden flowers, which are still more varied.

It has been well observed, that "the precious metals of Central America, together with quicksilver, copper, lead, iron, talc, litharge, and most other minerals that are in use, only await the labour and ingenuity of man to extract them from the earth, and convert them into objects of convenience and beauty; and seams of coal, ochre, gypsum, sal-ammoniac, and wells of naptha, are also ready to yield their valuable stores. Jasper, opal, and other precious stones are also found; and pearl fisheries have long existed upon the coasts. In fine, there is no lack of anything that nature can bestow to sustain, to satisfy, and to delight. So abundant are the necessities of life that none need want; so profuse are the bounties of nature that they are suffered to decay through neglect.

Lying between the parallels of 10° to 18°, and almost insular as to any influence of the continent on its temperature, the climate of the coasts and lowlands is hot and humid. That of the interior varies with the altitude, and is generally mild, equable, and salubrious. The two seasons aptly designated the 'wet' and the 'dry,' are well defined. They may be said equally to divide the year, though they vary considerably in different districts. The rains, everywhere copious, are more continuous in some parts, and the drought is more severe in others, but the dry season is occasionally interrupted by refreshing showers, and the wet is everywhere relieved by an interval of dry weather.

In the highlands of the interior, the seasons are singularly regular. The dry weather commences about the close of October, and terminates on the 12th or 13th of May, rarely varying even a few hours. It is most frequently on the 12th that the rainy season commences. The sky is then suddenly obscured with thick clouds, which burst simultaneously, often accompanied with thunder, and sometimes with

hail. This is confined to the afternoon, and returns on the following days, or perhaps for successive weeks at the same hour, or a little later. During the whole of the wet season, which is by far the most agreeable, the forenoon is almost invariably cloudless, and the atmosphere clear, elastic, and balmy. The rains are often confined to the evening and night, or to the night hours only. During the dry season, the mornings and evenings are often so cool and bracing as to predispose to active exercise, though fires are never resorted to. Through the day the sky is seldom obscured, and light clouds only are to be seen sweeping rapidly along the plains during the short twilight that ushers in the equinoctial day, thence they rise and hang in clusters round the tops of the mountains till the sun has gathered strength to dispel them; in the evening they return to attend its setting, and add inimitable beauty to the scene. At all seasons the entire disc of the moon is distinctly visible through all its phases, but now it shines with such uninterrupted clearness, as entirely to supersede, when above the horizon, the necessity of artificially lighting the streets; and even in its absence, the brilliancy of the stars dispels all gloom. In some districts on the eastern coasts, through local influence, it rains more or less all the year; which, however, adapts them for the growth of certain vegetable productions; while the districts where the dry weather lasts the longest are alone suitable for the cultivation of others. On the more elevated plains, such as those of Quesaltenango, in the department of Los Altos, the heat is never so great as during the summer months in England; and though snow is said sometimes to fall in December and January, it immediately dissolves, and the thermometer never descends so low as freezing point."

GULF OF PANAMA.

Variation about 6½° E. in 1879. There is little, if any, annual change.

The southern limits of the gulf of Panama are usually considered to be point Garachiné and cape Mala. The coast immediately south of the gulf is not properly included within the limits of the present work, but as many ship-masters using it, may make the gulf from southward, it is advisable to commence our description of the coast with cape Corrientes, New Granada.

CAPE CORRIENTES, the south-west extremity of which is in lat. 5° 28' 40", long. 77° 32' 38", may be easily known by the dome-like peaks of Anana, about 1500 feet high, which rise directly over it; this is the first high land north of Monte Christo (in lat. 1° 8' 40", long. 80° 40') and generally makes like an island from southward. It is densely wooded from the summit to high water mark, and the almost constant rains give a bright green colour to the peaks. At about 8 miles northward of the cape is

Alusea point, the northern extreme of the promontory. The water off this projecting point of land is deep, 50 fathoms being found close to the rocks, and 100 at a distance of less than 3 miles. In the vicinity of the cape the current appears to set constantly northward.

Cabita Bay.—On the south side of cape Corrientes is Cabita bay, situated eastward of a high rocky point, distant about 3 miles from the cape; although open to southward, there is here good anchorage, with a capital watering place. Vessels may lie in 18 fathoms at about three-quarters of a mile from the stream in the bight of the bay, with the western horn bearing S.W. by W. At about 5 miles south-eastward from the watering-place is the mouth of the river Jeya, southward of which is a remarkable perforated rock named Iglesia (or Church) de Sevilla. On the eastern side of the bay the high bold land suddenly terminates, and a beach, with low river land commences, extending, with the exception of the cliffs north of the river Buenaventura (in lat. $8^{\circ} 49'$) and that of Cascajal point, as far south as the river Esmeralda, a distance of 400 miles.

The coast from Alusea point northward trends eastward 14 miles to the river Nuki, a small mountain stream; the shore between consists alternately of bluffs and sandy beaches, with a few rivulets. At about 8 miles N.N.W. from the river Nuki is a cluster of high rocks, facing, at the distance of 2 miles, the river Chira, another mountain stream; and 8 miles northward of these rocks is the Morro Chico, a pinnacle of a similar nature. From these rocks the coast runs in the same direction, high, rugged, and woody, nearly 8 miles to port Utria.

Utria.—This harbour is about 3 miles long in a northerly direction by half a mile broad, and has an average depth of 12 fathoms. It is formed on the east side by a lofty but narrow peninsula, which has two islets and some detached rocks off its south point. The entrance is south-eastward of these; it has no hidden dangers, the shores being steep. The eastern side consists of a sandy beach, which runs out to a spit $2\frac{1}{2}$ miles within the entrance; at this point the harbour is only a quarter of a mile across, but northward of it, it widens and forms a commodious basin.

The situation of port Utria will be easily known by Playa Baia, a beach about 4 miles long, fringed with cocoa-nut trees; this is immediately northward of the peninsula, and the land behind it is low. At the north extreme of the beach is the mouth of the little river Baia, off which is a rocky islet.

Solano Point, in lat. $6^{\circ} 18'$, long. $77^{\circ} 27' 30''$, about 12 miles northward of the river Baia, is a long, rocky, tongue-like projection, on the eastern side of which is the bay of Solano. A reef, consisting of rocky patches with deep water between, extends $1\frac{1}{2}$ miles from the point, and has soundings of 16 to 30 fathoms close to it; it must therefore be carefully avoided. The coast southward of this point is high and rocky, with occasional small beaches. There is a patch of rocks 8 cables from the shore, at about 6 miles southward from the extremity of the point, and the water is deep (40 fathoms) within a mile of the coast.

Solano Bay is a deep but spacious anchorage formed by Solano point on the south-west, and a lofty promontory, which juts out some 8 miles on the north. It abounds in fish, wood, water and cocoa-nut palms; and there are considerable groves of

vegetable ivory, a palm-like plant found in low damp localities, in the vicinity of the sandy beaches. At about 2 miles south-westward from the north point of the bay, there is a small chain of rocky islets, nearly a mile long, the centre of which has a remarkable sugar-loaf form; they are barren and frequented by large numbers of gannets. The soundings in the bay are from 60 to 15 fathoms, the latter being close to the shore.

Cupica Bay.—From Solano bay the land trends northward about 20 miles to Cupica bay, which is about 5 miles wide, and justly considered one of the best anchorages on this coast. It is formed on the west side by a projecting point named Cruces, having off it some detached islets, the outermost of which is distant about 2 miles. Vessels may anchor in any part of the bay in a convenient depth, and find shelter from all winds except those from southward. The approximate geographical position of point Cruces is lat. $6^{\circ} 39'$, long. $77^{\circ} 30' 30''$.

When in Cupica bay, the nearest and most convenient mode of access to the Naípe, a tributary of the Atrato, is from Limon bay, on the eastern shore; the land above it is about 500 feet high, over which is a waterfall named Quebrada del Mar. The head of Cupica bay is a sandy beach $4\frac{1}{2}$ miles long, at the west extreme of which is the mouth of the river Cupica; on its banks there is a village with some plantations from which vegetables can be obtained.

It is high water, full and change, in Cupica bay at 8h. 30m., the rise being about 18 feet. The current in the offing sets northward.

Octavia Bay.—From Cruces point the coast trends north-westward 15 miles to point Marzo, in lat. $6^{\circ} 50'$, long. $77^{\circ} 40' 30''$, which is of a similar nature, and also has detached islets extending $1\frac{1}{2}$ miles southward from it. The bay eastward of Marzo point named Octavia, although smaller than that of Cupica, possesses convenient depth for anchorage. In addition to the detached islets off point Cruces there are high barren rocks of fantastic shapes lying about $1\frac{1}{2}$ miles southward of them; the passage between is deep and clear.

The COAST on the western side of point Marzo is bold, rugged, and thickly wooded; it runs in a northerly direction nearly 8 miles, to some detached islets, lying one mile from the coast with 10 fathoms in-shore of them. Thence the coast bends sharply to the eastward for 2 miles; the cliffs ceasing at the mouth of the river Coredó, a small stream easily entered by a boat, from which a continuous line of beach, with low lands behind it, extends to the north-west for 14 miles, as far as Ardita bay. On this part of the coast are the mouths of two small streams, the Carachichi and the Ouredó, both of which are barred. This whole coast, like that to the southward, is thinly inhabited, huts being generally found in the bays and in the vicinity of the numerous small rivers. Ardita bay may be known by a small islet lying off it. From Ardita bay to Pinas point, a distance of 82 miles, the coast is high, rugged, and thickly wooded, having deep water close to the shore, with the exception of two small bays situated about 20 miles northward of Ardita; the northern one, Gusgava, has convenient anchorage;—there is also a beach directly south of Pinas point.

Pinas Bay is about 8 miles northward of Pinas point. It affords the best anchorage between Octavia bay and Garachiné point. It is 2 miles deep by $1\frac{1}{2}$ miles wide, with

an average depth of 10 fathoms, and is open to south-westward, from which quarter occasional squalls in the wet season, throw a considerable swell into it. The head of the bay, the geographical position of which is lat. $7^{\circ} 84' 87''$, long. $78^{\circ} 9' 50''$, consists of a beach, little more than one mile in length, with low land behind it; the sides of the bay are high and rocky. Good water may be obtained from a stream at the west extreme of the beach, which is protected from the swell by a small natural mole on its western side. Vessels may anchor at about half a mile from the watering place in 8 fathoms; in the wet season they should keep more on the west side of the bay in 12 fathoms, with the end of the mole bearing N. by W. Off the western point of the bay are the Centinelas, two high barren rocks.

Garachine Bay.—From Pinas bay a high, bold, and wooded coast trends northward 88 miles to point Garachiné. At about 8 miles south-west from this point is cape Escarpado, off which is an islet named Cajualo. The land over point Garachiné is lofty, and mount Zapó (5 miles from the coast) will be noticed as a sharp conical peak, rising to an elevation of about 8000 feet. Garachiné bay, north-eastward of the point, between it and Paténa point, is shoal; its shore consists of low mangrove land, forming the mouths of the river Sambo, which is fronted with mud banks extending 8 miles from the coast. At the entrance of the western mouth is the Pueblo of Garachiné, a small collection of huts. Fronting the bay, in a direct line between Garachiné and Paténa points is a bank $5\frac{1}{2}$ miles long, with patches of 15 feet water on it, and 4 and 5 fathoms inside; and 4 miles N.W. by W. from the former point, is a small patch of $4\frac{1}{2}$ fathoms, with 6 and 8 fathoms close to it.

There is anchorage close off either of the points of the bay, the water being deep in their vicinity.

SAN MIGUEL BAY is immediately north of Garachiné bay. The entrance is $6\frac{1}{2}$ miles wide, between Brava point on the north and Paténa point on the south. At about 2 miles E.S.E. from Brava point is Lorenzo point, off which, within the bay are Iguana and Napoleon islets, the former is about $1\frac{1}{2}$ miles long, and is the larger of the two; 8 miles northward of these is the mouth of the river Congo.

From Iguana island eastward the bay opens, being nearly 11 miles across, and at 7 miles north-eastward of the island is Pierce point, a rocky projection on the north shore. The western side of the bay between Lorenzo and Pierce points is little known, but is reported to be shoal. The eastern side has plenty of water along it; off Paténa point, which is just separated from the main enough to make it an island, there is no known danger; at $2\frac{1}{2}$ miles inside this, in a N.N.E. direction, is Colorado point, bold and rocky, with a conspicuous patch of reddish clay on its face, the coast between forming a bay. The land then for $1\frac{1}{2}$ miles gradually decreases in height to Hamilton point, when it falls back to the eastward, and bends round again to the north, forming a bay $8\frac{1}{2}$ miles across, with low mangrove shores, having a village and anchorage in it; but as there are some ledges of rocks in this bay that do not always show, great caution is necessary in using it, and a boat should be first sent in to point out the deep water.

In the entrance to San Miguel bay, at a short distance from the north shore, there is an extensive bank, named Buey, upon which the sea breaks heavily; it is 6 miles

in circumference, and some of its patches are dry at low water. Its inner edge lies nearly $1\frac{1}{2}$ miles south-westward from Lorenzo point; the passage between should not be used, as there are only 10 feet least water in it, and generally a heavy swell. A spit of 12 feet extends $1\frac{1}{2}$ miles from its south-west end; and as only $4\frac{1}{2}$ fathoms are found at nearly 5 miles south-west from the bank, vessels should not stand within that depth. Colorado point, kept open of Patena point bearing N.E., is a good mark to clear this bank, and also for running into San Miguel bay.

At about 12 miles eastward from Lorenzo point, and consequently within the entrance of San Miguel bay, is Washington island, an islet 8 cables in length, as many broad, and densely covered with wood. It lies nearly $8\frac{1}{2}$ miles N.N.E. from Hamilton point, and between it and the nearest shore are several islets and rocks. The channel up the bay is northward of this island, between it and Jones island, a conspicuous little rock about 20 feet high, and covered with grass, lying $1\frac{1}{2}$ miles to the N.W. by W. of it.

The coast from abreast of Washington island takes a northerly direction for about 6 miles to Stanley island; in this space are several little bays, lined with mangrove, the points generally being of small elevation, rocky, and covered with bush. The channel is between the coast and a group of islands on the west, of which the easternmost is named the Strain; this little island is about 25 feet high, covered with trees and scrub, and surrounded by a ledge of rocks extending a short distance off it towards the channel, but connected by mud banks with two islands westward of it. At this point Barry rock, an islet 20 feet high, and covered with *cacti*, lying about 8 cables from the eastern shore, contracts the channel to one mile in width; apparently there is deep water all round this rock, but the passage on its west side being by far the widest, most direct, and sounded, there can be no object in using the other. The channel continues of about the same breadth to Virago point, a distance of $2\frac{1}{2}$ miles. When working through do not go within a line drawn from one island to the other, and avoid Bains bluff, one mile southward of Virago point, where there is a dangerous ledge of rocks at 3 cables from the shore.

Stanley Island, a low wooded island $1\frac{1}{2}$ miles long by one mile broad, divides the channel into two passages, both leading into Darien harbour; the principal one, or Boca Grande, being a continuation of the bay of San Miguel in a northerly direction past the west and north sides of Stanley island, and the other, or Boca Chica, between its southern side and Virago point. The latter channel, although much shorter, is too narrow for a sailing vessel to use with safety, on account of the rapid tide in it.

Boca Chica.—This has two dangerous ledges of rocks at its outer entrance, one on each side, the passage between them being barely $1\frac{1}{2}$ cables wide; the southern ledge lies nearly 1 cable west from Virago point and only shows at low-water spring tides. The Trevan rock on the north side of the entrance uncovers at half tide about 3 cables from the shore of Stanley island. Mary island, the northern of the group before mentioned, kept just midway between the summit and north-west extreme of Jorey island, bearing S.W., is an excellent mark for clearing these dangers, recollecting that if brought on with the summit, the vessel will get on the northern ledge, and if open to the westward she will be on the opposite one; when past these rocks keep in mid-

channel. A small ledge runs out a short distance from the south-east point of Stanley island, having passed which the vessel will be in Darien harbour, and may anchor, as convenient, in 5 to 10 fathoms, sand and mud. The Boca Chica is not, however, recommended, unless used at slack water, for during the strength of the tide it runs 6 or 7 knots; the eddies making the steerage difficult.

Boca Grande.—This lies between the rocks outside the Boca Chica and Milne island on the western shore, is one mile broad, and continues nearly the same width for $1\frac{1}{4}$ miles between Stanley island and the shore. After passing the Boca Chica steer north-westward, so as to shut in Mary island by Milne island, and do not approach Stanley island within 3 cables, as a dangerous rock, showing only at about three-quarters ebb and connected by a ledge with the shore, lies off its north-west point. Milne island just touching the eastern end of the islands connected with Strain island, bearing S. $\frac{1}{2}$ E., is a good mark for running; and if working, when northward of Milne island directly Mary island opens of it on the one side, and when Edith island is shut in on the other. The navigable channel at this point is three-quarters of a mile wide, and begins to turn to the eastward round the north end of Stanley, narrowing to half a mile between Ray and Jannette islands on the north, and a large flat rock, nearly always uncovered, and a little wooded island about a cable off Stanley island on the south; following the channel, it bends back to the south-east, and continues of the same breadth between Ellen and Paley islands on the west, and the main land on the east, into Darien harbour.

Darien Harbour is a magnificent sheet of water extending 11 or 12 miles in a south-east direction as far as the village of Chupigana. It is formed by the junction of the Tuyra and Savana rivers, and the depth of water in it from Paley island as far as the mouth of the Savana, a distance of 2 miles, is from 10 to $4\frac{1}{2}$ fathoms, beyond which there is not more than 12 to 18 feet at low-water springs. The best place for anchoring is in from 7 to 10 fathoms, off the village of Palma, one mile southward of Price point, at about 8 cables from the western shore. The Vaguila rock, showing at about half tide, lies off the mouth of the Savana, East $1\frac{1}{4}$ miles from Palma point, with a good channel between it and Graham point, the west point of entrance to the river. The shores of the harbour are almost without exception one continuous line of mangrove, with densely wooded hills from 100 to 800 feet high a short distance inland. Palma appears to be situated on the best spot, and has an abundance of fresh-water.

The *River Tuyra* rises in lat. $7^{\circ} 40'$, and enters Darien harbour near the village of Chupigana. Twenty miles from this point, near the junction of the river Chuquanaque, are the ruins of the old Spanish fort of Santa Maria, near which were the gold mines worked by the Spaniards in the 17th century. The river is described as being navigable 6 miles beyond the town, "abreast which it was reckoned to be twice as broad as the river Thames is at London. The rise and fall of the tide there was 15 feet." The river Chuquanaque rises in lat. $8^{\circ} 50'$, westward of Caledonia bay on the Atlantic.

The *Savana River* rises in lat. $8^{\circ} 44'$, and a few miles from its source meets the river Lara, where the bottom is level with the half-tide. From this point the depth increases, 8 fathoms at low water being found $8\frac{1}{2}$ miles to the southward, and from thence to the mouth, a distance of 12 miles, the depth varies from 9 to 12 fathoms

over a soft muddy bottom. The navigable entrance is nearly one mile wide between Graham point and Haydon bank, and the shores are low mangrove land, skirted with hills from 200 to 300 feet high, within 2 miles of the banks. H.M.S. *Virago* anchored in 8½ fathoms, one mile to the north-east of Graham point.

It is high water, on the days of full and change of the moon in Darien harbour at 4h., and springs are said to rise 24 feet. The tides in the narrows run proportionally strong, and great care should therefore be taken.

Brava and Lorenzo points, forming the north side of San Miguel bay, are edged with reefs and outlying rocks, on which the sea breaks with great violence; this fact, together with the proximity of the Buey bank, makes this part of the coast dangerous, and it should therefore be avoided, even by small vessels.

Farallon Ingles.—This is a small but high island, on the edge of the shoal off the river Buenaventura, at about 5 miles northward of Brava point; there are 12 and 15 feet water on its western side. At 4 miles northward of it is Gorda point, which is bold and woody with a depth of 4 fathoms close to it.

The *Pajaros* are two small rocky islets lying off the coast, 4 miles northward from Gorda point; there is a depth of 4 and 5 fathoms off their west sides, but only 12 feet between them and the shore. At these islets a shoal commences, with 5 fathoms on its outer edge, which fronts the whole shore of the bay of Panama as far westward as Chamé point.

River Trinidad, 2½ miles northward of the northern *Pajaros* islet, has a low rocky projection forming its south point of entrance. A 8-fathom channel was found into this river, extending 1½ miles from the point, beyond which it was not examined. The northern bank of the river is composed of mangroves, which continue along the coast, with the exception of the bluffs of the rivers Chiman and Chepo, as far as Panama, a distance of nearly 70 miles. Shag rock, a barren islet, frequented by birds, with shoal water round it, lies 2½ miles from this entrance.

Mangue and Majaguay, 7 miles from the entrance of the Trinidad, are high, wooded islets at tide time, but not at low water, being situated on the south-west edge of a large mud flat, which extends from the north bank of the river Trinidad. There are 10 to 12 feet water westward of them.

River Chiman, 4 miles northward of Mangue and Majaguay, is wide at the mouth, but shoal, being dry at low water, with the exception of some small channels deep enough for canoes. The entrance is well marked by the islets just mentioned and the wooded bluffs on each side. On the eastern side, under a hill, is the small town of Chiman.

Pelado Island.—At about 4 miles W. by S. from Mangue islet, and directly off the mouth of the river Chiman, is Pelado, a small flat island, about 60 feet high. It is steep on all sides, and useful as a mark to vessels bound up the bay for Panama, which should not go eastward of it.

The coast between Pelado and Chepillo islands, the latter distant 81 miles to the north-west, consists of low river land covered with mangrove bushes. In this space are several small streams, the principal of which are the rivers Hondo and Corutu; but these are shoal at the entrance. The land north of these rivers is of some elevation;

Column peak and Asses ears, about 12 miles north of Chiman, and Thumb peak, at the west extreme of the range, are conspicuous. Extensive mud banks, dry at low water, extend from 2 to 4 miles off the coast; outside these the water is shoal for some distance, hence vessels standing towards the main should tack in 9 fathoms.

Chepillo island, in about lat. $8^{\circ} 26\frac{1}{4}'$, long. $79^{\circ} 7'$, lies off the mouth of the river Chepo, at about 2 miles from the coast. It is one mile long by half a mile broad, low on the north side, and rises by a gentle ascent towards the south, over which is, or was, a remarkable tree, which forms an excellent mark to vessels bound up the bay. The southern point of the island may be approached as near as a mile, but the other sides are shoal, and a reef runs off its northern point in the direction of the river.

Chepo River extends some distance into the interior, having its rise near the head of the Savana river. The entrance is westward of Chepillo island, through a 10-foot channel, about 8 cables broad; there is a small hill, with a cliff under it, on the eastern bank, which, if brought to bear N.E. $\frac{1}{2}$ E. (1847), will lead through the deepest water.

At the west bank of this river the mud flat commences, and continues to Petillo point, immediately northward of Panama. It is shallow some distance out, in front of this flat, hence vessels should not approach the coast between Chepillo island and Panama, nearer than the depth of 6 fathoms.

PANAMA is a regular and was formerly a well-fortified city, standing on a rocky peninsula. It has a noble appearance from the sea, the churches, towers, and houses, showing above the line of the fortifications, stand out from the dark hills inland with an air of grandeur to which there is no equal on the west coast of South America. It is rendered still more conspicuous by mount Ancon, a beautiful hill, 540 feet high, rising nearly a mile westward of the city, to which it forms a pleasant background; on each side of Ancon are flat hills, with copses of wood and savanas, grassy slopes and wild thickets, while southward of the city the cultivated islets of Flamenco and Perico complete the scene.

The site of Panama has once been changed. The old city, built in 1518, which was taken and destroyed by the buccaneers under Morgan in 1678, stood at the mouth of a creek, about 4 miles north-east of the present city. The spot is now deserted, but well marked by a tower, which, together with an arch, two or three piers of a bridge, and some fragments of a wall, are the only remains of a once opulent city. The tower, in the afternoon, is still a conspicuous object from the anchorage.

The expectations formed of the modern city of Panama, as seen from the sea, are by no means realised on landing. The principal streets extend across the peninsula from sea to sea, intersected by the Calle Real or Royal street, which runs east and west, and has a quiet and stately, but comfortless, air. Heavy balconies in the upper stories are but little relieved by any variety in the buildings. The houses, mostly in the old Spanish style, are of stone, the larger having courts or patios; the public edifices comprise a cathedral, five convents, a nunnery, and a college, but most of these are in ruins. The cathedral is a large, lofty building, on the west side of the Plaza, but the structure is hardly worthy of its situation, the towers alone redeeming it from insignificance, and forming in the distance an ornament to the city. A great want

is felt in Panama with regard to drainage. This is caused by neglect; for the elevation of the peninsula on which the city stands, together with the great rise of the tide, offers considerable advantages for cleansing the city, which duty at present is performed by the heavy rains of the wet season.

The gold discoveries of California and British Columbia, by increasing the colonization and developing the great agricultural resources of those countries, have effected a change in the fallen fortunes and grass-grown streets of Panama; and comfortable inns and large well-stocked stores have been called into existence by the continuous transit of emigrants from Europe and the United States to San Francisco and Victoria; this traffic has, however, decreased since the establishment of the railway from New York to San Francisco.

The suburb of Santa Ana, situated on the isthmus which connects Panama with the mainland, is almost as extensive as the city, though not so well built. At its northern extreme is the terminus of the Panama railway to Colon or Aspinwall, on the Atlantic, a distance (by rail) of 47 miles. This railroad was only completed in January 1855, since which time the company has been constantly making improvements.* The line

* The problem of constructing a canal across the isthmus of Panama to connect the two great oceans, the Atlantic and Pacific, has lately been again revived. In the spring of 1879 a Congress was held in Paris for the purpose of discussing the various schemes which have from time to time been put forward. At its termination the report of the *Technical Committee* on the seven schemes which it had considered was read and may be briefly summarized as follows:—The Tehuantepec, 240 kilomètres, 120 sluices, 12 days transit. Nicaragua, Menocal-Blanchet schemes each 292 kilomètres, 17 sluices; cost of construction, including sluices, 770,000,000f, total cost 900,000,000f; 44 days. Panama, level canal, 78 kilomètres, one sluice, six kilomètres of tunnel; construction 1,070,000,000f, total cost 1,200,000,000f; two days. Panama, sluices, 78 kilomètres, 12 sluices; construction 570,000,000; total cost 700,000,000; two days. San Blas, 58 kilomètres, 16 kilomètres of tunnel; construction, 1,270,000,000f, total cost 1,400,000,000f; one day. Atrato Napuipi, 290 kilomètres, two sluices, four kilomètres of tunnel; construction 1,000,000,000f, total cost 1,180,000,000f; three days. The expense of working and repairs was set down in each case, capitalised at 5 per cent., at 180,000,000f. As to the Tehuantepec route, the committee had no data on which to estimate the cost, but believed it would greatly exceed that of any of the other schemes. The Nicaragua project offered an inexhaustible reservoir of water, and a port could easily be made on the Pacific side; but serious difficulties were to be apprehended at certain points. The Panama schemes offered excellent ports at both ends, and the existing railway would facilitate the transit of material. Subject to tidal sluices at the Pacific end and the complete isolation of the waters of the Chagres and its affluents, the level scheme was quite satisfactory. The Darien projects were not acceptable. The committee objected also to the Nicaragua scheme, though technically feasible, on account of the volcanic nature of the country and consequent liability to destruction of the work. The Panama route, on the other hand, had long been free from volcanic action, and was decidedly preferable above all others. The choice lay here between a level canal and one with sluices, and the committee decidedly preferred the former.—A report was likewise presented by the President and office-bearers on the Congress at large and those of the various committees. This document cited the Suez Canal traffic and charges as proof of the remunerativeness of the enterprise, and advocated a flat canal, through which 50 ships could pass daily, and capable of sheltering at least 60 ships at a time. It recommended the Congress to adopt the following resolution:—*The Congress holds that the cutting of an inter-oceanic canal of uniform level—a work so desirable in the interest of commerce and navigation—is practicable, and that the maritime canal, in order to meet the indispensable facilities of access and utilisation which ought to be offered by a passage of this kind, should be made from the Gulf of Limon to the Bay of Panama.*" The roll was then called, and each member of the Congress was asked to vote upon the resolution. M. de Lesseps

is only a single one but there are four sidings, one at each of the following places :— Gatun, Barbacona, Matachin and at the summit (268 feet above the sea-level). It is maintained in the greatest efficiency by stations, situated 4 miles apart. The time occupied in the transit is about 4½ hours, and the fare is (or was) 25 dollars. A telegraph is established between its termini.

A regular mail service is established from England to the West Coast of South America, via the Panama railway. After touching at all the principal ports on the coast Valparaiso is reached in 42 to 50 days.

The trade of the isthmus of Panama is extensive ; it is carried on mainly by a large fleet of first-class steamers, many of them registering from 2000 to 3000 tons. These steamers, or others on the same lines, make regular semi-monthly trips direct from the isthmus to upwards of 50 different ports, in no less than 15 distinct countries.

Panama affords the usual supplies which are to be obtained in tropical regions. Provisions of excellent quality may also be obtained from the United States ; and, when time will admit of it, getting such from the States is preferable to purchasing in the markets of Colon or Panama. The United States squadron have all their stores and provisions sent across the isthmus.

Water can be obtained at Panama from the tank of the U.S. mail steamers ; but it is cheaper at Taboga, where it may be purchased at two dollars a ton. Coal may be bought here at times from the mail companies, but it is generally dear ; the cost of coal imported into Panama by way of Cape Horn being 16 dollars per ton, and by the railroad 15 dollars (1860). Consuls of all nations reside of Panama.

Large quantities of Peru bark, balsam, cochineal, cocoa, coffee, hides, india-rubber, indigo, logwood, oil (whale and cocoa-nut,) sarsaparilla, vanilla, gold, silver, and hundreds of other commodities of the Pacific, seek a market *via* this great central route of the globe. The population of the city is estimated to be about 12,000.

The geographical position of the isthmus of Panama, the absence of high mountains, and the vast extent of forests and other uncultivated parts, tend to produce a hot and rainy climate, which nevertheless, with the exception of a few localities, as Chagres, Colon, and Portobello, is healthy and more favourable to the constitution of Europeans than that of most tropical countries. The most prevalent disease is intermittent fever, which makes its appearance during the change of the season ; remittent fever is less frequent, but generally proves fatal. On board ship, Panama is by far the most healthy place on the coast of Central America.

The seasons are regularly divided into the wet and dry ; the former commences in the latter end of May and lasts till November. Slight at first, the rain gradually increases, and is fully established in June, when it falls occasionally in torrents,

voted in its favour, and Sir John Stokes also voted affirmatively. The resolution was carried by 74 to 8, there being 16 absentees.

To carry out this gigantic work a Company, under the name of the "Inter-Oceanic Canal Universal Company" has been started (August 1879) under the Presidency and Direction of M. Ferdinand de Lesseps, President-Director of the Suez Canal. The work is expected by the promoters, to occupy about 8 or 10 years, but it is doubted by many whether it will ever be accomplished.

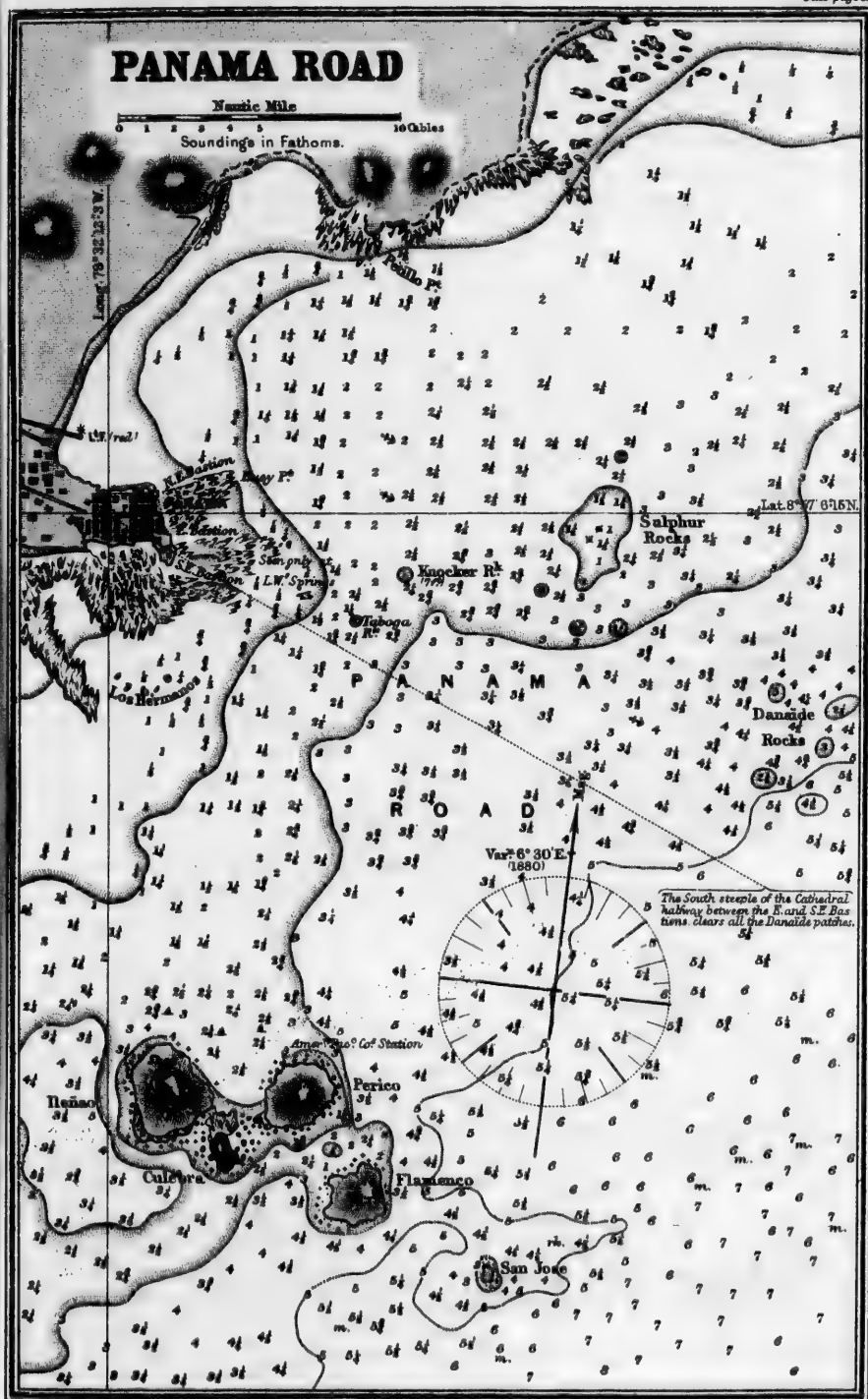
accompanied by thunder and lightning; the air is loaded with moisture, and calms or light variable winds prevail. The temperature varies from 75° to 87° Fahr.; still the atmosphere is oppressive, until cooled by the heavy rains and thunder storms before-mentioned. About the end of June the rains are suspended for a short time; and the occurrence of this phenomenon is so regular that it is looked forward to by the inhabitants, who call it the *veranito* (little summer) de San Juan, probably from its taking place almost simultaneously with the feast of St. John (June 24th.) In December the violent rains cease and the north-west wind sets in, producing an immediate change, and the climate now displays all its tropical beauties.

Dampier's remarks on the climate of Panama are too true to be omitted:—"There are no woods nor marshes near Panama, but a brave, dry champaign land, not subject to fogs or mists. The wet season begins in the latter end of May, and continues till November. At that time the sea breezes are at S.S.W., and the land winds at North. The rains are not so excessive about Panama itself, as on either side of the bay; yet in the months of June, July, and August, they are severe enough. Gentlemen that come from Peru to Panama, especially in these months, cut their hair close, to preserve them from fevers; for the place is sickly to them, because they come out of a country which never hath any rains, but enjoys a constant serenity; but I am apt to believe this city is healthy enough to any other people."

The Port.—The port of Panama is formed by Petillo point (a black rocky promontory with two small hills over it, between which is a rivulet admitting boats at high water), 1½ miles north-eastward of the city, and the point upon which the city stands, the shore between forming a bay nearly three-quarters of a mile deep, the head of which is of mud fronted by a sandy beach. A great portion of this bay is dry at low water springs; at its entrance there is a depth of 8 feet. It is here that the terminus of the railroad across the isthmus is situated, consisting of an iron pier 450 feet long, up to which the smaller steamers come for the transport of passengers and merchandise between the shore and the ocean steamers at Perico or Tobago. Large canoes, well fitted for the navigation of the gulf are also employed for the minor trade as they are useful in transporting the various tropical productions of the isthmus to the port of Panama.

Light.—A fixed red light is exhibited from the end of the railway pier, which is situated a quarter of a mile to the northward of the city.

Petillo point, the north point of the bay, is surrounded by rocky ledges, which extend out 1½ cables, and have a depth of 10 feet at their extremity. Buey point, the southern horn of the bay, is the north-eastern point of the long rocky ledges that surround the eastern and southern shores of the peninsula of the city; it is only visible at low tide. These ledges extend 8½ cables from the north-east bastion, 5 cables from the south-east bastion in an easterly, and 2½ cables in a southerly direction, forming a bay southward of Buey point, in which is easy landing after half-flood, on a sandy beach in front of the Monk's gate, one of the principal entrances to the city. The general landing, however, is north of Buey point, at the market place on the northern side of the town. Abreast the suburbs on the southern side, another ledge runs off for nearly three-quarters of a mile, eastward of which are Los Hermanos,



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three black rocks visible at first quarter ebb. Detached rocks, with 8 and 7 feet water between them, visible only at low water springs, lie off the south-east extreme of the rocks, the outer one being 3 cables from the reef. These ledges, composed of rock with sand patches between, although dangerous to boats, afford every facility for erecting substantial piers and improving the port. As yet (1879) no attempt has been made at works at this description, but the daily increasing trade must ultimately necessitate improvements of this kind.

Guinea point, 2 miles south-westward of Panama, is the northern extreme of a large round hilly projection, which forms the western side of Panama road. Between it and the town are the mouths of the Grande, Arena, and Falfan, small rivers, with cultivated banks. The water on this side of Panama road is shoal as far as Tortola and Tortolita islands, which lie 2 miles southward of Batele point, the south extreme of the hilly projection above-mentioned. One mile E. by S. $\frac{1}{2}$ S. from Batele point is Changarmi island, surrounded by the Pulperia reefs; and to the south-west of the point are Bruja and Venado points, rocky and projecting, with the outlying islets of Cocovi and Cocoviceta. Although these dangers are mostly above water, this part of Panama bay should be avoided.

Perico and Flamenco, with the outlying rock of San José, are a group of islands, forming the south side of Panama road. Ilenao and Culebra, the western and southern parts of Perico, are connected with Perico by an isthmus of beach and rocks; but at high water these present the appearance of three islands. Perico is the head-quarters of the United States mail steamers, the bay on its northern side forming a convenient anchorage, while on the isthmus, which is sandy on that side, steamers of 2500 tons have been easily beached. Vessels using this anchorage after passing Flamenco should keep close round the north end of Perico, and anchor when the isthmus opens. Large vessels drawing over 20 feet may coal at Perico by passing west of the group at half-tide, with Ancon hill (which on that bearing makes like a cone) just open of Ilenao, N.N.W.; pass about a cable from Ilenao, and anchor off its north-west end in 24 feet, when Perico opens. In both cases attention must be paid to the time of tide. The passage between Perico and Flamenco is shoal, and should not be used; that between Flamenco and San José is deep, and both islands are steep.

Danaïde Rocks.—These patches of conical rocks, lying on the eastern ridge of Panama road, E. by S. $2\frac{1}{2}$ miles from the south-east bastion, have only 15 to 18 feet water on them, and $3\frac{1}{2}$ and 4 fathoms on all sides. They lie awkwardly in the track of vessels standing for the anchorage, keeping their hull with the land breeze. The Hermanos rocks, in line with the hill between the rivers Grande and Falfan, bearing W. by S., lead northward of them; and the south steeple of the cathedral kept half-way between the east and south-east bastions, W.N.W., leads southward of them. This spot is a favourite fishing-place, and vessels should avoid canoes seen in its vicinity, as they are probably fishing on the rocks.

Sulphur Rocks.—This dangerous reef, 6 cables long by 3 cables broad, lying one mile north-westward of the Danaïde, has a rock awash in its centre, with 6 and 9 feet around it, and outlying patches of 12 and 14 feet. The railroad flagstaff on with the centre of Ancon, bearing W. $\frac{1}{2}$ S., leads northward of the reef in 15 feet, but this

passage should not be used at low water springs; and the Hermanos rocks in line with a round peak over the river Grande, lead southward of the reef in 18 feet.

The *Knocker* and *Taboga* are two rocks, with only 6 feet water on them. The *Knocker*, which is, or was, marked by a red buoy with staff and flag on it, lies nearly one mile E. $\frac{1}{2}$ N. from the south-east bastion; the *Taboga* lies a little more than 2 cables south-westward of the *Knocker* buoy, with 16 feet water between, and 12 feet in-shore of them, but no stranger should attempt to pass westward of the buoy.

TABOGA ISLAND, with *Urava* and *Taboguilla*, a group of islands about 4 miles long by 2 broad, are situated 9 miles southward of Panama. *Taboga*, the largest and westernmost, is 985 feet above the sea, well cultivated, and has a considerable village on its north-east side. Northward of the village is the *morro of Taboga*, a small hill, connected with the main island by a low, sandy isthmus, covered at high water; this is the head-quarters of the Pacific Mail Company, who have here a steam factory and coal stores, also a gridiron, 800 feet long, on which H.M.S. *Magicienne*, a vessel of 1255 tons, was repaired in 1858.

Vessels visit *Taboga* from Panama to obtain water and supplies, both of which are more readily obtained than at the city; water can be procured from the Company's tank. The anchorage off the village is convenient, being about 8 cables from the shore in 10 fathoms, with the peak of *Urava* on with the high cliff of *Taboga*, and the church from S.W. $\frac{1}{2}$ S. to West.

Urava is a small lofty island, separated from *Taboga* by a narrow and shoal channel; off its southern extreme is the small islet of *Terapa*.

Taboguilla, 710 feet high, is well cultivated, with some islets off its south-west extreme, and forms the north-east island of the group, with a wide and deep channel between it and *Urava*, in the centre of which is a sunken rock just awash at low water; the sea seldom breaks over it at high water and it must be carefully avoided by closing either island, both being steep-to, or vessels may pass south of it by keeping the isthmus of the *morro* open, bearing N.W. by W. $\frac{1}{2}$ W. *Farallon*, a small islet, also lies in this channel, but it is steep-to with 11 fathoms between it and *Taboguilla*.

Tides.—It is high water on the days of full and change, in Panama road at 8h. 28m., springs rise from 15 to 22 feet, and neaps from 10 to 16 feet. The ebb sets south from 1 to 1 $\frac{1}{4}$ miles an hour, and is stronger than the flood, which runs to the north-west. The long swell which occasionally sets into the road always ceases with the flowing tide. It has been remarked by the officers of the U.S. Pacific mail steamers that there is more rise in the small bay north of the town, and also in their own anchorage off *Perico*, than in the more open parts of the road.

Directions.—Sailing vessels bound to Panama should endeavour to get within 8 or 4 miles of *Chepillo* island, especially between December and June, and so have all the advantages of the prevailing northerly wind. From this position *Ancon* hill will be seen, and should be kept a little on the port bow, as the wind hauls to the westward on approaching Panama. Vessels drawing over 18 feet should pass south of the *Danaide* rocks, by keeping *San José* rock* open of the west point of *Taboga* island,

* We believe a light, visible 7 miles, is exhibited on *San José* rock, when the steamers from *San Francisco* are expected.

bearing S.S.W. $\frac{1}{4}$ W., until the cathedral towers are open eastward of Alicou. Having passed the Danaide rocks the ship is fairly in the road and may anchor according to her draught;—if no more than 18 feet draught she may have Tortola island just shut in by Ilenao, bearing S.S.W. $\frac{1}{4}$ W., and San José rock open east of Taboguilla island. Vessels drawing 24 feet may anchor north of Perico, with the peak of Urava island on with the east point of Flamenco, bearing South, taking care not to open Changarmi northward of Perico. If it is necessary to work up the road to an in-shore berth, tack on the western side just before Perico and Flamenco touch; and in standing to the eastward do not open San José of Taboga island.

Vessels drawing 14 feet can pass north of the Danaide and south of the Sulphur rocks, with the Hermanos rocks on with the right side of the peak, between the rivers Grande and Falfan; then San José rock on with the peak of Taboguilla bearing S. $\frac{1}{4}$ E. leads between the Sulphur and Knocker rocks; and they may anchor north of the Knocker buoy in 16 feet, keeping it between Perico and Flamenco, with Gabilan, a small rocky peninsula west of the town, just shut in by the south-east bastion. During neap tides they may anchor still farther to the N.W.

Panama road, although shoal, may be considered secure; the ground being muddy holds well. A resident in Panama for five years, stated, that during that time there was no known case of a vessel being driven from her anchor; and with good ground tackle and common precaution a vessel might lie there all the year round with one anchor down. Attention to the tides and soundings of the roadstead will enable a vessel to lie close in at times for the discharge of cargo.

Geographical Position.—The position of the south-east angle of the south tower of Panama cathedral is lat. $8^{\circ} 57' 6''$ 15, long. $79^{\circ} 32' 12''$ 8. The longitude was determined by telegraph from Aspinwall, by Lieut. F. M. Com. Green, U.S. Navy, in 1875.

Chame Bay.—The coast southward of Panama between Bruja point and Chamé point, a distance of 16 miles, forms a shoal bay, with several outlying banks and rocky islets; hence vessels bound to Panama should keep near the island of Taboga, and not approach this shore within the depth of 5 fathoms. Vique cove, in which is a small village, is 5 miles westward from Bruja point. About one mile north-eastward of Vique is a lofty treble-peaked hill, called Cerro de Cabra, a conspicuous object to vessels bound to Panama, and frequently mistaken for Taboga by those coming from eastward. Vacamonte point, the western side of Vique cove, is the only break in the mud flat which fronts this land, and extends out nearly 2 miles from shore.

Chamé bay, at the head of which is a small river of the same name, is nearly filled up by large banks, the largest of which, the Cabra spit, lies in the middle, and has on it an islet named Tabor. Chamé point, the southern horn of this bay, is a singular, low, woody promontory, $5\frac{1}{2}$ miles long by half a mile broad. Between it and Cabra spit is a convenient harbour, 2 miles in length by about three-quarters of a mile wide, with from 8 to 8 fathoms water in it, and from 16 to 18 feet close to the beach of Chamé point. To the north-west of the river is a high range called Sierra Capéro, and to the southward are the Cerro Chamé, a group of wooded hills.

Melones Island is a small rocky islet $2\frac{1}{2}$ miles north-westward from Taboga, having at about half a mile northward of it, a rock of the same name above water. The island is steep, but vessels should be careful not to pass westward of it.

Chamé Island, with the Perique rock, are of a similar character to Melones, and situated about the same distance southward of Taboga.

Valladolid is a large rock, nearly 2 miles south-westward of Chamé island, having 9 and 10 fathoms close to it.

Otoque and *Bona Islands*, with Estiva island and the Redondo rock lying 6 miles south-eastward from Chamé point, form a group similar to, but somewhat smaller than Taboga and Taboguilla. A village, named Goleta, is in the bay on the western side of Otoque. Anchorage, in from 10 to 14 fathoms, may be found in any part of this group, and all dangers are above water. These islands being high and peaked, form good land-marks to vessels on this side of the gulf of Panama.

PARITA BAY.—From Chamé point the coast runs south-westward 45 miles to Parita bay, and consists throughout of a beach, named Playa Grande, which is backed by a low wooded bank. There is a depth of 4 and 5 fathoms at about 2 miles from this beach, except S.S.E. $\frac{1}{2}$ E. of the Cerro Chamé, where there are only 4 fathoms at nearly 7 miles from the land, the bank extending from that to Chamé point. To avoid this, vessels from Parita bay should shape a course to pass about 2 miles southward of Bona until Taboguilla is nearly touching Otoque, bearing N. by E. $\frac{1}{2}$ E., when they may steer up the bay, inside but nearer to the islands.

The mud-flats are found again on the western side of Parita bay, the coast being a low mangrove shore, intersected by the mouths of no less than five small rivers; the land to the westward is also low with several hummocks. At Liso point, on the south side of the bay, the hard bank with sandy beach in front again commences and continues as far as cape Mala, a distance of 88 miles, the coast trending to the south-east.

Parita bay is about 18 miles long north and south, and 10 miles deep, and has soundings of 18 fathoms at 10 miles from the shore, the depth gradually decreasing to the land. It is exposed to all winds blowing from eastward.

Iguana Island.—At about 80 miles south-eastward of Liso point, and 9 miles northward of cape Mala, Iguana island, which is a little higher than the adjacent coast, forms a conspicuous object. A ledge extends about 8 cables from its southern end also from its eastern point, and a reef is said to stretch to the N.N.E. from its north point, but otherwise the island is steep to with 15 fathoms in the channel between it and the main.

It is high water, full and change, at Iguana island at 4h.; the rise and fall being 15 feet. The flood sets northward, and the ebb south-westward, the latter being considerably the stronger, especially between December and March.

Cape Mala, which forms the western point of entrance to the gulf of Panama, is a low but cliffy point with outlying rocky ledges, having deep water close to them. The land from the north-west slopes gradually to the sea at this point from a considerable distance, making the exact cape difficult to distinguish, unless the breakers are seen. On opening the gulf round this cape, a strong southerly set is generally experienced, especially in the dry season.

PEARL ISLANDS.—These form an archipelago on the eastern side of Panama bay, consisting of sixteen islands and several rocks. Rey is the largest; San José, Gonzales, Casaya, Saboga, and Pacheca are of secondary, and the rest of minor importance.

There are from 80 to 40 fishing villages scattered about these islands, the inhabitants of which are chiefly engaged in the pearl fishery. The islands are low and wooded, the soil fertile, but not much cultivated, and the numerous cocoa-nut groves, and bright sandy beaches, intersected by small rocky bluffs crowned with trees, give them a pleasant appearance; most of them belong to merchants at Panama, who employ negroes to plant and cultivate them.

Pacheca, Saboga, and Contradora Islands, with the islets of Bartholomew and Chipre, form the northern part of the archipelago, and between them is a good and capacious harbour, well suited as a depôt for steamers. Saboga, the largest island, on the east side of which is a considerable village, has a reef extending $1\frac{1}{2}$ miles in a northerly direction; Contradora has 5 fathoms close to its north-west shore, which is low and well adapted for wharves. This harbour, which is about 2 miles long by nearly one mile broad, with an average depth of 9 fathoms, has Saboga on its western side, Contradora on its south-east, and Pacheca and Bartholomew on its north side; it has three entrances, each possessing a 5-fathom channel, which may be used according to wind and tide. The Pacheca channel lies southward of Pacheca, between it and the reef extending from Saboga; the Contradora channel is round the northern end of Contradora island; and the Saboga channel is between that island and Contradora.

It is high water, full and change, at Saboga island at 4h., and springs rise 14 feet.

Vessels using the Pacheca channel should pass within half a mile of the islet west of Pacheca, and stand southward until the centre of Bartholomew island bears E. by S. $\frac{1}{2}$ S.; then keep it on this bearing until Dick islet off Saboga opens westward of Saboga bearing S. $\frac{1}{2}$ E. which will lead to the anchorage.

Entering by the Contradora channel, vessels should pass half a mile eastward of Bartholomew island and not stand to the westward before the nearest islets north of Saboga open northward of Saboga; these islets kept just open bearing W. by S. lead through. Care must be taken not to open them too much, as there is a 2-fathom patch off the north-east end of Contradora.

Vessels from eastward using the Saboga channel should steer in with the outer islet on the reef extending from the south end of Saboga bearing W. $\frac{1}{2}$ S., as this will lead clear of the Sunk rock, a patch lying nearly a mile off the south side of Contradora; and, when Pacheca is shut in by Saboga, bearing N. $\frac{1}{2}$ W., they should steer northward, and run through the channel which is steep on both sides. There is a channel northward of the Sunk rock, but that south of it is wider and better.

Approaching the Saboga channel from westward, sail close to the islet of Santa Catalina, which lies about $1\frac{1}{2}$ miles south of Chipre, to avoid the shoal extending from the latter island. From Catalina steer N.E. for the north end of Chapera, the island next south of Contradora, until Pacheca touches Contradora, bearing N. by W.; then steer N.N.W. $\frac{1}{2}$ W. for a small hill on Saboga, taking care *not to shut in* Pacheca with Saboga until the north point of Chipre bears southward of West, and that Pacheca is *shut in* before the south point of Saboga bears West, then stand for mid-channel as before.

Chapera and Pajaros, the islands immediately southward of those just mentioned, are separated by a 4-fathom channel in which the ground is foul and consequently not safe to navigate. A shoal with 18 feet water on it lies one mile eastward of Pajaros,

and southward of that island the soundings are rocky and irregular. No vessel should attempt the passage south of Chapera and Pajaros islands—between them and Rey island.

Casaya, *Bayoneta* and *Viveros*, are the largest among the numerous islands on the reef extending from the north-west point of Rey island; the passages between them all are foul, with occasional strong tides. At nearly 4 miles eastward of the north point of *Casaya* is a bank $1\frac{1}{2}$ miles long by three-quarters of a mile wide, having only 9 feet water on its shoalest part; and at about 2 miles from the north-east point of *Viveros* are the *Caracoles* and *Cangrejo* islets, with foul ground around them. The whole of these islands may be avoided by vessels bound up the bay, by not approaching their western side nearer than just to open San José island eastward of Pedro Gonzales island, bearing S. by E.; while on their eastern side, they should not open San Pablo, a small islet off the north-east point of Rey island.

Rey, the principal of the Pearl islands, is about 15 miles long, in a north and south direction, by 7 broad; it has several peaks on it, the highest of which is about 600 feet above the sea. Numerous islets, having deep water between them, lie 8 miles off its western shore, and these should not be approached by strangers within the depth of 10 fathoms. Cocos point, its southern extreme, is a remarkable promontory, 4 miles long by about one wide, the extreme cliff of which was crowned in 1859 by an umbrella-shaped tree. On the east side of this promontory is the bay of St. Elmo, where is convenient anchorage, and a good stream of water at Lemon point at its head; the soundings in this bay are 10 to 6 fathoms, the latter being at a short distance from the shore.

The eastern shore of Rey has also islands off it, which may be approached to half a mile, with the exception of that named *Canas*. This is an island about 6 miles northward from St. Elmo bay, the larger of two islands separated from the shore by a narrow channel; it has off it a sunken rock at nearly a mile distance, and three-quarters of a mile outside this is a patch of 8 fathoms;—to avoid these sunken dangers do not open Mongé islet, eastward of St. Elmo, until Pablo islet opens eastward of Muerta, a small barren islet lying about $1\frac{1}{2}$ miles north-eastward of *Canas*.

San Miguel, the principal town of the Pearl islands, is on the north side of Rey. It is of considerable size, and has a conspicuous church, but is badly situated, landing being difficult at low water. Two hills—the Cerro Congo and Cerro Vali—rise southward of it, the former being 481 feet high. Vessels having to lie off the town should run in between *Caracoles* and *Cangrejo*, and anchor in about 6 or 7 fathoms, when the church is shut in or behind *Afuera*, an islet lying off the town, bearing S.E. by S. The bottom in this anchorage is irregular and rocks are numerous, hence more than ordinary care is required.

Galera, an islet lying $7\frac{1}{2}$ miles E. $\frac{1}{2}$ S. from Cocos point, the southern extremity of Rey, is generally the first land made by vessels bound to Panama from south-eastward; its approximate geographical position is lat. $8^{\circ} 11\frac{1}{2}'$, long. $78^{\circ} 45\frac{1}{2}'$. Its southern side consists of a cliff sloping down to a beach on the north, and to the southward a reef runs off for nearly a mile. It should not be approached within the depth of 10 fathoms, but there is a good passage between it and Cocos point, by using which vessels will be clear of the San José bank.

San José Bank lies about 9 miles in an E.S.E. direction from Galera island, and immediately faces the entrance to San Miguel bay. It consists of a bank of 7 or 8 fathoms, which extends N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S. 8 miles, and is in no part more than three-quarters of a mile broad. Close to it all round is a depth of 12 to 18 fathoms, which in a westerly direction deepens to 80 fathoms at less than a mile. In the centre of this bank is the Trollope rock, having only 2 feet water over it at low tide; it bears W. $\frac{1}{2}$ S. 15 miles from Garachiné point, and E.S.E. 9 miles from Galera island. The shoal upon which this rock stands is one mile long by about three-quarters of a mile broad; the depth close to the rock is $3\frac{1}{2}$ to 6 fathoms, and there are 7 and 8 fathoms on its outer edge—vessels should not therefore approach it within the depth of 10 fathoms. The rock may be easily avoided, either by keeping on the main shore until Garachiné point bears southward of East, or by passing about 2 miles from Galera island, taking care at the same time not to run on the shoal patch and rocks off the southern side of the latter.

Pedro Gonzales is separated from the islets off the west side of Rey by a broad deep channel. It is about 12 miles in circumference, and has on its northern side two small bays protected from the north by the islands of Senora and Senorita. These bays, known as Perry and Magicienne, are divided by the little peninsula of Trapiche, off the east point of which is a rocky ledge, terminating in a shoal with 14 feet water, at a distance of nearly 3 cables from the point; inside this, to the southward, there is a small anchorage in $4\frac{1}{2}$ fathoms. Magicienne bay is small and shoal; on its western side a stream of water runs into the sea. Perry bay the eastern one, is about a mile in extent each way.

Senora and Senorita, including the shoal off their eastern side, are about one mile long, and lie nearly the same distance northward of Trapiche, with a 7-fathom channel between, steep on both sides.

Tides.—It is high water, on the days of full and change of the moon, in Perry bay at 8h. 50m.; and the rise is 16 feet. The tide stream is not felt in the anchorage, but there is a considerable set off the island, the flood running to the northward, the ebb to the southward, the latter being generally stronger.

Directions.—Vessels may pass on either side of the Senora and Senorita; if on the east side, avoid the shoal extending from them by keeping the eastern point of Gonzales island, a rocky peninsula, open of the point next north of it, bearing S.S.E., until the north end of Senora is shut in by Senorita, bearing N.W. by W. $\frac{1}{2}$ W. Going into Perry bay, a good look-out must be kept for the shoal running off E.S.E. from Trapiche island.

Passage Rock.—At nearly $1\frac{1}{2}$ miles S.S.W. $\frac{1}{2}$ W. from the rock off the south end of Pedro Gonzales, there is a dangerous rock, awash or nearly so at low tide, named Passage rock, lying in almost mid-channel between Pedro Gonzales and San José. It has soundings of 12 and 9 fathoms close to it, and 7 to 5 fathoms at a short distance northward of it. The mark to lead rather more than half a mile southward of it is,—the peak next south of the highest on Rey island, just open southward of Coco islet, one of the outlying islets off the west side of Rey, bearing E. by N. $\frac{1}{2}$ N. Vessels should keep between the San José shore and this mark.

San José Island, four miles South of Gonzales, is about $6\frac{1}{2}$ miles long by 3 miles broad, and its summit consists of table land. At nearly 2 miles south-eastward from Iguana point, its northern extreme, is a large waterfall, flowing into the sea, and forming an excellent watering place. At the south-east side of the island there is a bay, in which are soundings of 8 to 5 fathoms, but, as the swell sets in there with great violence, it is not convenient for shipping. Off the southern point of the island are a number of high rocks of singular and fantastic shape; this part of the island should be avoided. The western shore is bold and cliffy, with a small bay near the centre.

WINDS, CURRENTS, &c., in the GULF OF PANAMA.—The navigation of the approaches to the gulf of Panama, situated as they are in the region of the doldrums, with the land of Central America considerably affecting the northern trade, becomes to a vessel unaided by steam one of the most tedious, uncertain, and vexatious undertakings known to the sailor. Steam power will considerably simplify these difficulties, but the experiences of a sailing vessel may materially assist the navigation of the auxiliary screw steamer in this portion of the Pacific.

Winds.—Between cape Corrientes and Panama, the prevalent winds are from northward and westward, with frequent squalls and wet weather from the south-west between the months of June and October.

In the gulf of Panama the winds are regulated by the seasons; the prevalent wind, however, is from northward. In the fine season, commencing in October, these winds are regular and constant, bringing fine dry weather. Southward of the gulf they blow much harder, and off the coast of Veragua a double reefed topsail breeze in January and February is not uncommon. In April and May the northerly winds are less regular, and have more westing in them, with calms, light sea, and land breezes, with occasional squalls from the south-westward. In June the rainy season sets in, and the southerly winds become stronger. Still the old north-west wind is mostly found after noon, and vessels sailing from Panama at all seasons will generally have a fair wind until south of cape Mala.

Between the Galapagos islands and the coast, westward of the meridian of 80° , and southward of the parallel of 5° N., the winds are between South and West all the year round, and, except between the months of February and June, they are of sufficient strength and duration to make the navigation easy; but northward of lat. 5° N., between 80° and 110° W., is a region of calm and doldrums, accompanied by rains and squalls of a most vexatious description. The weather met with can hardly be better illustrated than by the facts that in May 1848 H.M.S. *Herald*, in her passage towards the Sandwich islands, although towed for 6 days as far west as $80^{\circ} 20'$, still took 40 days from Panama to 110° W., owing to keeping between the parallels of 8° and 10° N., and in March of the following year, in the meridian of 87° , and the lat. of 8° N., only made 80 miles in 9 days.

Currents.—The gulf of Panama is also subject to varying currents, partly caused by the peculiar formation of the land, and apparently influenced in turns by the Peruvian or Mexican streams, according as the relative strength of each predominates. Thus Malpelo island is surrounded by a strong current, having much the appearance of

breakers. Here one navigator found the current setting strongly into the gulf N.E. by E. at the rate of $2\frac{1}{2}$ miles an hour, while others describe it as running violently in the opposite direction. That these varying statements should be equally correct is not at all incompatible, considering the position of the island amidst conflicting winds. This uncertainty is another embarrassment to the navigation between Panama and the Galapagos. A steady current, however, has generally been found to set northward after passing cape San Lorenzo, extending off shore for about 60 miles. This stream runs along the coast of the continent, round Panama bay, and then sets with considerable force, especially in the dry season, southward down the western side of the bay. After passing cape Mala it meets the Mexican current from the W.N.W. and thus causes the numerous rippings and short uneasy sea so often met with at the entrance of the gulf. This troubled water will be found more or less to the southward, according to the strength of the contending streams.

PASSAGES.—*Bound to Panama:*—From the foregoing it will be seen that the passage from southward into the gulf of Panama is easily made during the greater part of the year, by keeping about 60 miles from the coast north of Guayaquil, and after crossing the Line shaping a course for Galera island, at the same time taking care, especially in the dry season, to stand in-shore with the first northerly winds. By so doing vessels will most probably have the current in their favour along the coast; whereas by keeping in the centre or on the western side of the gulf, a strong southerly set will be experienced.

After making Galera and clearing the San José bank, the navigation between the Pearl islands and the main is clear and easy, with the advantage of being able to anchor, should the wind fail and the tide be against the vessel. As a rule, this passage should be taken, but with a strong southerly wind, the navigator is tempted to run up the bay, in which case he should keep towards the western shore of the Pearl islands, where anchorage and less current will be found should the wind fail, an event always to be expected in these regions.

Vessels bound to Panama from northward should make the island of Hicaron, which lies about 50 miles westward of Mariato point, and from this endeavour to keep under the land as far as cape Mala. If unable to do this, they should push across for the opposite coast of the continent, when the current will be found in their favour. On getting eastward of cape Mala the safest plan is to shape a course for Galera island and to use the eastern passage. At the same time, if tempted up the gulf by a fair wind, vessels should endeavour to get on the western coast of the Pearl islands, which have the advantages already explained.

Bound from Panama.—The great difficulty, however, is the passage out of, or rather from Panama bay. The best plan for sailing vessels, whether bound north or south from Panama, is to push to the southward and gain the South-east trade; by so doing they will not only avoid the doldrums and vexatious winds before described, but will have the additional advantage of salubrious weather, with the sea at a temperature of 75° instead of 88° Fahr. The passage northward has been made by keeping close in shore after passing cape Mala, and navigating by the sea and land breezes; but this should only be attempted by vessels that are well found and manned, unless they are bound to the ports of Central America, when it is their only route.

The following directions, especially intended for sailing vessels, are chiefly by Lieut. Maury, of the U.S. Navy :—

From the bay of Panama a vessel should make the best of her way south until she gets between lat. 5° N. and the equator ; on this course let her endeavour, if possible, to keep near the meridian of 80° W. From this make a S.W. course if the winds will allow. Should the wind be S.W. stand to the southward, but if S.S.W. stand to the West, if a good working breeze ; but if it be light and baffling, with rain, the vessel may know that she is in the doldrums, the quickest way to avoid which is by getting to the southward.

From lat. 2° N., between June and January, vessels may stand off from the coast to the westward, and pass northward of the Galapagos islands, taking care to keep southward of 5° N. As far as 85° they will have South and S.S.W. winds ; but after passing that meridian the wind will haul round to the southward, and vessels bound to the South Pacific may consider themselves fairly in the trade. Vessels bound northward, after passing the meridian of 105° may edge away for the Clipperton rock ; after passing which they may push to the northward for the northern trade.

Between January and April it may be better to cross the Line between the Galapagos islands and the coast before pushing to the westward. This may probably take a week, which outlay of time, however, is far preferable to encountering the baffling weather met in that season north of the Galapagos. In this route it must be remembered that southward of lat. 1° N. the wind hauls to the eastward as the vessel leaves the coast, and in the meridian of 88° it is frequently found eastward of South ; but at the same time, vessels in standing off before crossing the equator, must take care to avoid being driven to the northward of that latitude. In fact, there are few passages in which so much depends on the skill and experience of the pilot as in leaving the gulf of Panama.

Vessels bound to the northward in the above season should keep south of the Line until westward of 105° , when a course may be shaped for 10° N. and 120° W., in which track they will probably find the northern trade.

The above difficulties will be easily avoided by auxiliary screw steamers, which vessels may at once proceed to the starting points above mentioned. The best plan will be to steam for the meridian of 85° W. on the equator, from which position a course may be shaped, according to their destination, and to the season of the year. From that point their sails will be found to be as powerful as their engines.

The following facts will show the singular advantage of even small steam power in these regions :—In 1859, an indifferent, old, screw steamer, the *Columbus*, belonging to the Panama Railway Company, had been running with great regularity for upwards of a year between Panama and San Jose de Guatemala, a distance of about 1020 miles, calling at Punta Arenas, Realejo, La Union, and Acajutla, both going and returning, at each place discharging and receiving cargo and mails,—and sailing from Panama on the 17th of every month, and returning to that port on the 6th of the following ; thus making the round in 19 days. It is estimated that it would take two months for a sailing vessel under favourable circumstances to perform the same work.

CAPE MALA TO CAPE CORRIENTES.

Magnetic Variation in 1879:—At Coiba Island 6° 50' E.; Gulf of Nicoya 6° 55' E.; Salinas Bay 7° 5' E.; Gulf of Fonseca 7° 10' E.; Acajutla or Sonsonate Road 7° 25' E.; Gulf of Tehuantepec 7° 50' E.; Acapulco 8° 20' E.; Manzanilla Bay 8° 30' E.; Cape Corrientes 9° E.

There is little, if any, annual change.

The coast from cape Mala trends sharply westward, and continues low so far as Guanico point, a distance of 22 miles. From this point it gradually rises for 7 miles to the Morro Puercos, a lofty headland, which forms the commencement of a range of high coast land. North-eastward of Guanico point is an open bay, into which two small rivers, the Tomosi and Juera, empty themselves.* From Puercos point the coast trends 27 miles to Mariato point, a bold headland at the termination of the high land of which Morro Puercos is the commencement. This point is a good landfall for vessels bound to Panama from westward, as by keeping under the land eastward of it they will avoid the southerly current setting from the gulf.

Frails.—These are two low barren islets situated 11 miles south-westward from cape Mala, and about 18 miles north-eastward from Puercos point. They are distant from each other 2 miles in a N.N.W. $\frac{1}{2}$ W. and S.S.E. $\frac{1}{2}$ E. direction, and are clear of outlying dangers, with the exception that a reef extends out about a cable from the north-west point of the southern islet. The depth within half a mile of them is 20 to 30 fathoms.

At 18 miles westward from cape Mala is a projecting point named Raia, off which is an islet and reef of rocks, known as the Benado. At about midway between the rivers Juera and Tomosi, is a patch of rocks at a short distance from the shore. A reef, 8 fathoms under water, lies about 8 miles north-eastward from Puercos point, and another, above water, is distant 4 miles westward from the point; the latter is at about a mile from shore. Thence to Mariato point, the soundings are very deep, as at 3 miles from the shore the bottom is not reached with a line of 100 fathoms.

From Mariato point the coast trends 5 miles north-westward to Naranjas island, a rocky but wooded islet lying about half a mile off a bluff; it is steep, with 10 and 20 fathoms at a short distance from it. Northward of this islet the low land again commences, and continues into the bay of Montijo.

MONTIJO BAY.—From point Mariato the coast trends N.N.W. 20 miles to the eastern entrance of a large bay, named Montijo. This bay extends northward about 14 miles, with an average breadth of 9 miles, and is fronted by two islands, Cebaco and Gobernador, of which the former is the larger and southernmost. Within the bay, near its head, is an island named Leones, having on each side of it a river accessible

* In this bay vessels occasionally anchor, with the wind from the land, near the islet Benado, and obtain fresh-water from the river Juera. As the anchorage is exposed to southerly winds, it can be considered only a temporary stopping place.

only by boats. The bay is of little value to shipping, the soundings in it being extremely irregular, and over the greater part of its surface only 10 to 12 feet; hence it is but seldom visited.

Cebaco is an island of irregular shape, 18 miles long in a N.E. by E. $\frac{1}{2}$ E. and S.W. by W. $\frac{1}{2}$ W. direction, and 8 miles wide at its eastern end, its broadest part. Some detached rocks lie off its western end; and a sunken rock lies about a mile from its eastern point, leaving no safe channel between. When entering the bay by this, the east channel, it is necessary on account of this sunken rock to keep nearer to the main than the island,—in steering thus the depth will be 12 to 10 fathoms; continue now in a north-westerly direction and pass St. Juan rock, distant about $1\frac{1}{2}$ miles from the land, on its west side; the depth will now have decreased to 4 fathoms; hence to the east side of Leones island the passage is westward of several rocks lying off the shore, in soundings of 6, 7, and 9 fathoms.

Gobernador island, between the west end of Cebaco and the main, is about $1\frac{1}{2}$ miles in extent, and divides the western entrance of Montijo bay into two channels, either of which can be taken, although the northernmost is the better, being wider and less exposed to the strong outward current from the bay. The depth in the southern channel is 9 to 7 fathoms, and in the northern 16 to 6 fathoms. When the bay is fairly entered, vessels of light draught may anchor on its west side, and find good shelter from almost all winds.

When tacking in Montijo bay the utmost caution is necessary on account of the shoal of 12 feet which extends the whole length of the bay and connects the northern side of Cebaco island with Leones island. This shoal occupies a large part of the surface of the bay, and leaves but a narrow channel on each side of it.

BAHIA HONDA.—From Montijo bay to the entrance of Bahia Honda the distance is 20 miles in a W. by N. $\frac{1}{2}$ N. direction, and the shore between is rugged with several islets and rocks off it. At the distance of 2 miles from the land the soundings are 27 to 85 fathoms, the latter being in the vicinity of Bahia Honda. In the event of running from one bay to the other, the coast should have a berth of not less than 8 miles.

The bay consists of an inlet nearly 8 miles in extent in a N.E. direction, and about 2 miles broad, in which are soundings of 20 to 10 and 4 fathoms. It affords shelter from all winds, and a berth may be selected according to circumstances in almost any part of it. The head of the bay, north-east from Talon Island (subsequently mentioned) is shallow, but may be safely approached by the lead. When running in it is only necessary to keep in mid-channel.

The entrance does not stand out with sufficient prominence to be distinguished from a great distance, but a near approach reveals it with distinctness. The north point, Guarida, is bold, with a depth of 14 to 10 fathoms close to the rocks at its base. The south point, cape Jabali, has two islets off it, named Sentinela and Cuzo, of which the former is the larger and northernmost; these islands are connected by a sunken reef, and there is a narrow passage between them and the shore only suitable for boats.*

* The French chart No. 1708 shows a detached sunken reef at about one-sixth of a mile north-eastward of Sentinela island. Although this reef does not appear on the English (Admiralty) chart No. 1929, it may possibly exist, and should therefore be carefully guarded against.

Within the bay and immediately facing the entrance is Talon island, having two small islets close to its west side, of which the larger and northernmost is named Pueril; the island close to its south end is named Espuela. Talon island is about 120 feet high, and divides Bahia Honda into two parts, known as Chinche and Legamo bays; Chinche bay is west of the island. Only vessels of very light draught can pass round the north end of Talon island. In 1854, the island was inhabited by some Indian families, from whom were procured eggs, fowl, and various kinds of fruits, and as the bay affords abundance of excellent fish, such could also without doubt have been obtained from them.

Fresh-water can be procured here in great abundance and especially from a stream named Cobre, which falls into the south-east part of the harbour, and can be ascended some distance in a canoe. There is a watering place on the south side of the bay, S.S.E. from Talon island; a boat may in calm weather anchor alongside it and obtain supplies by means of a long hose. Very good water may also be procured from a cascade outside the harbour, on the north shore, at about $1\frac{1}{2}$ miles from point Guarida.

It has been mentioned that anchorage can be obtained in almost any part of Bahia Honda, but that which is perhaps the most convenient for large vessels is westward of Talon island, in Chinche bay, in about 14 fathoms water. The only known dangers in the vicinity of this anchorage are a sunken rock of 8 feet at $1\frac{1}{2}$ cables northward of point Guarida, and a reef at about the same distance north-westward from Pueril island.

Tides.—When the French surveying vessel *Obligado* was at Bahia Honda, in 1854, the tidal observations showed the flood and ebb to have nearly equal strength, of the two the ebb preponderating. High water at full and change 8h. 30m., and the sea rose $11\frac{1}{2}$ feet.

Making Bahia Honda.—Coiba island and the little island Afuera (between Coiba and the main) immediately face Bahia Honda, hence these islands will be first seen from whatever quarter the bay is made. At about 2 miles from the harbour are two islands named Medidor and Pucora, situated off the north shore, of which the former is the larger, of moderate height and nearer the land; these islands must be left to northward when running for the bay. The entrance is by no means difficult, but it is recommended to avoid the southern headland because of the reefs surrounding Sentinela and Cono islands.

Leaving Bahia Honda.—The most convenient time for leaving Bahia Honda is during the morning, because then advantage can be taken of the East and N.E. winds. If these winds are weak it may be necessary to haul the vessel out by the boats.

Monita and Rosario Bays.—The coast from Bahia Honda northward, a distance of 10 miles, is very irregular and forms several bays, of which those named Monita, Rosario and Pajaro are the principal. The first mentioned bay is immediately northward of point Ventana, 2 miles from Medidor island; it has an islet covered with trees in its northern part close to the shore, and affords good anchorage and shelter only with winds from the land, being exposed to all others. North of Monita bay is Rosario bay, which will be easily recognised by an islet near its middle, at about a mile from

* Named Trucha in Sir Edward Belcher's (R. N.) chart, No. 1920.

the shore, named Muela à Caballo; this bay is bounded on the north by point Muerto and on the south by point Gorda, between which is a projecting point dividing the bay into two parts, the southern of which takes the name of Pivay,—in each of these little bays is a river. As Rosario bay is exposed to westward, the anchorage is safe only with winds from the land. Pajaro bay, immediately northward of that of Rosario, has a depth of $16\frac{1}{2}$ fathoms, and is also unsafe with winds from westward. All this coast is free from danger at a moderate distance off.

The shore from Pajaro bay northward for a distance of 9 miles is fronted by a bank of 6 to 18 feet which extends out about 2 miles. The edge of this bank being very steep renders the utmost caution necessary in approaching; at night a depth of 22 to 16 fathoms will be quite near enough;—usually, the sea breaks heavily upon it. At the south end of this bank is the river Lavenia, and at the north end the river Tavasera; the latter is not barred.

PUEBLO NUEVO.—At about $8\frac{1}{2}$ miles northward of the Tavasera is point Cayado, the south side of entrance to the river of Pueblo Nuevo. The entrance to this river may be at once recognised by the peculiar formation of the hills between it and Tavasera river, which are 300 to 400 feet high, and appear as two islets from a distance. A hill 550 feet high, and having the form of a sugar-loaf, situated close to the shore on the north side of the river, is also a good landmark. In front of the entrance, almost due West from it, are two islets named Silva and Silva de Afuera, of which the latter is the westernmost; these are also good marks for the river.

In the entrance to the river are two large marshy islands formed of the soil brought down by floods; these are named Espartal and Porcada,—the latter is the southernmost. The channel between the islands is too shallow, and too much obstructed by shoals to be navigated except at high tide, and then only by boats, the entrance to the river is consequently south of the islands between them and point Cayado, and is about three-quarters of a mile wide; the channel north of the islands is also unnavigable. The depth in the principal channel, in 1854, was 6 to 8 fathoms at low tide, and it was then sheltered on the north side by the Belitre bank, partially dry when the tide was out, extending westward from the south end of Porcada. Immediately within or eastward of this bank is a rocky islet named Perdono.

The best time to enter the river of Pueblo Nuevo is during the flood and with the wind from seaward. Special care is required on account of the shoal extending seaward from Porcada islet, the limits of which are indicated by breakers while there is any sea. Having entered, steer for Perdono islet and pass it on its south side; the depth hereabout will be $4\frac{1}{2}$ fathoms, deepening to $6\frac{1}{2}$ and 7 fathoms, fine sand. Good anchorage may be found immediately southward of Perdono islet, in 4 to 5 fathoms water.

Perdono islet is steep and safe to approach; it may be rounded (1854), but there will be little occasion to go north of it, the channel south of it being wide and the main body of the river. In the event of going north of it, keep close to it on account of the shoal from Porcada island. The depth eastward of the south point of Porcada island is very irregular, and frequently does not exceed $8\frac{1}{2}$ fathoms; hence it is not a convenient anchorage for large vessels, but for small vessels drawing less than 16 feet it

offers the advantage of being well shut in and protected from almost all winds. According to the inhabitants, westerly winds, frequent from June to October, occasionally send into the river a very heavy sea, which causes considerable inconvenience to vessels anchored near Perdono island; at such times it will be advisable to run farther into the river, and obtain shelter under the south-east side of Porcada,—the best passage is westward of Conejo, an island situated about a mile from Perdono.

The village of Pueblo Nuevo is at some distance within the river, and such is the difficulty of the navigation that it is necessary to be guided to it by a native. Here, although it is but a small place, almost all kinds of provisions can be obtained in considerable quantities.*

The best time to leave the river is when the land-wind is blowing and a little before the end of the flood. Steer so as to give point Cayado a berth of about a cable, and pass southward of the islands Silva and Silva de Afuera, after which such a course may be run as may be convenient. If necessary, a vessel may run between the two Silvas, but the channel eastward of the easternmost islet is safe only for those that draw 10 to 15 feet; an isolated rock off the north-west side of Porcada, at three-quarters of a mile from shore, must be carefully avoided. The north end of Silva island has a shoal extending from it nearly a mile.

Tides.—It is high water full and change at 8h. 44m. The tide apparently rises 8 to 9 feet.

The foregoing description of the river of Pueblo Nuevo is based chiefly upon the observations of the French surveying vessel *Obligado* in 1854. According to the chart of Sir Edward Belcher, R.N., 1859, a spit of $2\frac{1}{2}$ fathoms runs off about a cable from the west side of point Cayado, and on the south side of the point are some rocks close to the shore, named Nueces, which are above water. The shoal extending northward from Silva island has not more than 10 feet on its extremity, and as it nearly joins the sandy spit jutting out from the north end of Porcada island, the channel north of the island cannot be considered safe. The soundings between the Silva islands are 9 to 12 fathoms, the latter being near Silva de Afuera. Sir Edward Belcher says, "the port consists of the outlet of a large river, which takes its name from a small village of huts, situated on the river Santiago, at some distance from the entrance. It is formed by a neck or island about 8 miles in length, which affords good anchorage for vessels of any class. Three larger streams discharge themselves into the main basin at the western end of this island, where the apparent great entrance is situated; but so studded with rocks and shoals, as to be unnavigable for anything larger than boats. It is in fact, an extensive archipelago, as most of the regions towards the Chiriqui territory will be found to be on future examination.

Water cannot be procured in any quantity, although it may probably be procured by digging wells. The principal article of trade was sarsaparilla, that of this neighbourhood being esteemed of superior quality. The stream runs fresh at some miles up, but we did not either meet it, or succeed in finding the town. Sugar-cane, of good

It is said that the serpents in the various islands of the river, and also in the marshy land immediately bordering it, are of a venomous character.

quality, was offered; and tortoise-shell, one of the articles of trade, can be procured at the season."

The COAST from Pueblo Nuevo takes a sudden turn in a westerly direction, and at the distance of 28 miles is point Juco or Ojo, the east side of David Bay. Nearly all this shore is low and fronted by a sandy strand. In the interior, at about 12 miles from the sea, is a chain of mountains of considerable altitude, one of the peaks, in lat. $8^{\circ} 28'$, long. $81^{\circ} 55'$, being 3140 feet high; the country at the foot of these mountains consists in general of a well wooded plain. The entrances of the various rivers can usually be easily recognised by the white trunks of the mangrove trees, only the tops of which are in leaf; these rivers are barred, and the approach to them is known better by the nature of the bottom than by the depth, it being sandy in their immediate vicinity and muddy outside. Along all this coast as far as David bay there are no known sunken dangers, and vessels may run along it at the distance of 2 or 3 miles in soundings of 11 to $9\frac{1}{2}$ fathoms. At about 18 miles from Pueblo Nuevo is the commencement of some cliffs of a red colour, which are very conspicuous; these continue some distance, and then the coast turns sharply southward and forms point Juco, the east side of David bay. On the east side of point Juco are some islands named Benado, which are a good mark for the bay to vessels approaching from eastward.

San Lorenzo Bay.—The bend of the coast just mentioned, terminating in point Juco, forms a bay named San Lorenzo, from a river of that name which falls into it. It is so thickly strewn with rocks that all vessels should avoid entering it; from the same cause the river cannot be approached except in boats. There is rather a considerable village on this river at a few miles from the sea.

DAVID BAY is included between Juco point and a large island named Parida, $11\frac{1}{2}$ miles south-westward from the point. In it are numerous islands and rocks, but with the assistance of the Admiralty chart No. 2816, little difficulty will be experienced in selecting an anchorage. At about a mile south-westward from Juco point are two islets connected together and surrounded by a reef, named Monitas, the southern of which bears a close resemblance to a saddle; and, at $2\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from these islets is an isolated rock named Viuda, having a reef extending from it about half a mile in an E. by S. $\frac{1}{2}$ S. direction—as this rock and reef are both steep, with soundings immediately around them of 10 to 12 fathoms, they require great care to avoid. It is said that to vessels approaching David bay from southward the presence of the Viuda reef may generally be known by breakers, but whether this be the case or not, it is a very formidable danger.*

In nearly the middle of David bay is a very dangerous rock named *El Busy* which is only visible at half tide, and for which unfortunately no well defined landmarks can be given. Its position is 8 miles W. by N. from the southernmost Monitas islet, and about $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from the largest San José islet. Its extent is but small, and the soundings close to it are 5 to 7 fathoms.

* A sunken rock, the existence of which there is great reason to doubt, has been reported at about 4 miles S.S.E. from the Viuda. The French surveying vessel *Obligado* sought for it unsuccessfully, although assisted in the search by a native of the country, who stated that he had seen the breakers upon it. The difficulty of finding an isolated sunken rock in deep water is well known; hence it will be prudent to exercise more than ordinary vigilance when in the vicinity of this reported danger.

David bay is so named from the river which falls into it, upon which is situated at the distance of $3\frac{1}{2}$ leagues in the interior the principal city of the province of Chiriqui in the state of Panama; the city bears the names of David or David Chiriqui, and is in lat. $8^{\circ} 27'$, long. $82^{\circ} 26'$; it can only be reached by boats, through a very intricate navigation.* At a short distance to the westward is the boundary between the Confederation of New Granada, and the Republic of Costa Rica.

The channel between the Monitas islands and point Juco is not considered safe, although the depth is 7 to 8 fathoms; hence vessels seeking the anchorage in David bay almost invariably pass southward of these islands, between them and the Viuda rock, or between the latter and the islets off the east side of Parida island. The mark to steer for is the San José islands, a small group of islands 4 miles westward of the Monitas; as these are covered with trees, and at low water the little sandy channels which separate them become dry, they are easily recognised. Vessels may approach the San José islands to a moderate distance, if ordinary precaution be taken to avoid any undiscovered outlying danger there may be about; having made the islands, bear up a little northerly and anchor, or anchor about midway between the islands and the Monitas. The only known sunken reef in the bay is the Buey rock, already mentioned, for which a good look-out must be maintained.

Buey rock, being an isolated danger at a considerable distance from shore, can be passed on all sides. To pass it on the west side, give San José islets a berth of about half a mile, and steer with them bearing South to S. by W., until the bottom changes from mud to gravel, when the vessel will be inside the rock. If, on the contrary, the intention be to go eastward of the rock, pass the Monitas on the south side, and steer for Carré island, $1\frac{1}{2}$ miles W.N.W. from Juco point, and afterwards continue along the south side of the chain of islets as far as the entrance to Boca Chica, off which there is anchorage in $4\frac{1}{2}$ to 5 fathoms. This anchorage is safe during the fine season, as it affords good shelter from the prevailing breezes, and especially from northerly winds, which at that time have occasionally considerable strength; but during winter, when S.W. winds prevail, it is better to anchor farther out under shelter of the San José islets.

The coast north of the chain of islands extending from Juco point to the entrance of Boca Chica forms a bay named Playa Grande, in the north-eastern part of which is an

* The city of David had in 1854 a population of about 5000. Its distance from the sea is about 10 miles, but the Boca San Pedro, the mouth of the river David nearest to it, has a bar across it which is, we believe, so shallow as to be impassable; hence vessels are obliged to resort to the Boca Chica, 16 miles eastward of it, making a total distance of 26 miles from the city. Around the city are cultivated lands which reach to the foot of the extinct volcano of Chiriqui. There is but little commerce, and that chiefly with Panama.

From the summit of the volcano of Chiriqui the waters of the Atlantic and Pacific can be perceived, and it has been proposed to construct a railway across the level country between the two oceans. It is said that there are no obstacles to the construction of such a means of communication greater than an engineer of average ability would be able to overcome with ease. The proposed route was from Almirante bay on the north side of the isthmus, to David bay on the south side, taking the city of David on the way; hence vessels would have a sheltered anchorage at each terminus. A bed of coal of considerable value traverses the whole distance.

inlet, known as Chuchegal bay. Flaya Grande has not been closely examined, and is reported to have many sunken reefs in it; the soundings over its surface are probably 4 to 8 fathoms. The country behind Chuchegal bay affords abundant pasturage for cattle.

Boca Chica, the narrow channel between Saino and Ventana islands, is $8\frac{1}{4}$ miles W.N.W. from Juco point, and is the only entrance to the river David practicable for vessels, which must be of very light draught, there being at low tide only 6 to 10 feet water in some parts of it. Boca Chica may be recognised by the rocks of Ventana island, which have been pierced by the sea. On the east side of the entrance is a rock named Lavandera, an isolated danger visible except near high water, situated about $1\frac{1}{2}$ cables southward from Saino island, and which must be carefully guarded against, there being a depth of 4 and 5 fathoms close to its south side.

At the village of Boca Chica (also known as *Puerto de San Lorenzo*), on the north side of the river and $8\frac{1}{4}$ miles from the sea, the usual articles of provision can be procured, such as poultry, eggs, fruits, vegetables, &c. Meat cannot be obtained in any quantity, but cattle can be sought without difficulty. Fresh water of excellent quality can be got from the stream immediately east of the village.

Tides.—It is high water on the days of fall and change of the moon at Boca Chica at 8h. 15m. The rise of tide is about $10\frac{1}{2}$ feet. During the *Obligado's* visit, the flood at the anchorage outside the entrance was observed to flow N.N.W., and the ebb the contrary, with an average strength of 1 mile per hour, which diminished in force towards the San José and Monitas islands. Within the entrance and in the river, the current was much more violent.

When leaving David bay, if obliged to go westward of the San José islands, it is recommended to approach nearer those islands than to Palenque, because of the rocks extending from the latter; the depth in the channel between is 6 and 7 fathoms. In the French chart No. 2816 a sunken rock of $11\frac{1}{2}$ feet is inserted at about half-a-mile westward of the south part of the San José islets. Having cleared this sunken rock, a wide berth should be given to some rocks situated $1\frac{1}{2}$ miles almost due South from the San José islets; the depth throughout is 8 and 9 fathoms.

Parida Island.—This is an island of irregular shape, $8\frac{1}{4}$ miles long in a N.N.E. and S.S.W. direction, and about $1\frac{1}{4}$ miles wide in its broadest part. It is well wooded and there are rivulets affording abundance of water. Numerous islets, having among them many sunken reefs, are scattered about on its east and south-east sides to the distance from it of 3 to 4 miles, the largest (and almost farthest to seaward) of which is named Bolano; these islets and reefs make the approach to David bay from south-westward a proceeding of some little risk. Among the islets and reefs there are doubtless channels which might be navigated in boats, but vessels must keep outside them, as they have not been closely examined.

The only commodious anchorage near Parida island is at its north-east end, under protection of an island which affords shelter from southward; the depth is $6\frac{1}{4}$ fathoms on mud, and there is a little sandy bay where a landing can be effected. If from David bay, vessels may pass either on the west or south sides of San José islands; if the former, it is necessary in the boards to westward to tack immediately the depth becomes 4 fathoms. If this anchorage be approached from seaward, steer for the Viuda rock,

and, passing it at the distance of about $1\frac{1}{2}$ miles on the west side, direct your course for the San José islands; leave these islands to the northward, and then steer for the north end of Parida island, maintaining a depth of 7 to 6 fathoms, but decreasing to $3\frac{1}{2}$ fathoms as the anchorage is approached;—when it deepens again to $6\frac{1}{2}$ fathoms, anchor. The lead should be kept going, and a good look-out kept for any undiscovered sunken rocks. At this end of Parida plenty of good water may be obtained.

Chimmo bay.—At the south-west end of Parida island is a little bay named Chimmo, where is a depth of 10 to $2\frac{1}{2}$ fathoms; good fresh-water may be obtained here. In front of the bay is a little islet known by the name of Santa Cruz; the passage in is north of this islet, because some rocks extend from it southward to the shore. A reef also runs off southward a short distance from some islets on the north side of the bay.

When sailing round the south-west point of Parida island, it should have a berth of about a mile, on account of some sunken rocks, half a mile from it, which have a depth of 15 and 16 fathoms close to them.

From Parida island northward to the archipelago of islets fronting the coast, there is, with the exception of a narrow channel of 8 to $3\frac{1}{2}$ fathoms close round the north end of the island, a bed of rocks through which there may be channels fit for boats. The sea usually breaks upon these reefs when there is any wind.

Point Burrica.—From the south end of Parida island to the extremity of point Burrica the bearing and distance are W. by S. $\frac{1}{2}$ S. 84 miles. The coast between forms a large bay which recedes 20 miles from a supposed line connecting these points. The shore in the east part of the bay consists of low islands forming the delta of the river David. The principal entrance to the river, the Boca San Pedro, is between Sevilla and San Pedro islands, and as already noticed is impracticable for vessels. Sevilla is the easternmost island; it abounds with game of various kinds, which can easily be obtained. San Pedro is the westernmost of the large islands of the river; from this island the coast trends westward and southward to point Burrica, and along the northern shore are met with in succession the rivers Piedra, Pinos and Bartolomé. In all this bay there is no sheltered roadstead, nor does it possess any advantage which should make it a place of resort for vessels.

COIBA ISLAND.—This is the largest island off the coast between Mariato and Burrica points, as it is 19 miles long in a N.W. by N. and S.E. by S. direction, and about 12 miles wide in its broadest part. It is covered with forests, and there is abundance of good water in every part. Vessels may anchor off it on all sides during fine weather, but unfortunately it possesses no bay nor harbour in which shelter may be obtained from all winds. As it is at present (1854) uninhabited, it is seldom visited. It was surveyed in 1848 by Lieut. Wood, R.N., and a chart (No. 1928) of it was subsequently published by the Admiralty. To this chart we must refer the reader, for the various details of its coast and outlying reefs.

The western coast of Coiba island appears, from the survey, to be of moderate height, and bold, and there are no known dangers outside those abutting on the shore. At about half way down there is an open bay, named Hermosa, in which is a depth of 20 to 14 fathoms.

On the eastern coast of the island is Damas bay, 5 or 6 miles in extent, which

affords a good depth of water and excellent shelter from westward. The soundings are from 80 to 15 fathoms, shoaling to the shore; and water may be obtained in the northern part of the bay. Good holding ground, mud, will be found 5 or 6 miles off shore, in 80 to 85 fathoms. Off the southern shore of the bay rocky shoals extend nearly a mile out, so that care is required to avoid them. In the middle of the bay the land is low, and here there is a small stream, named San Juan, at the entrance to which are some sandy flats.

Few vegetables or fruits are to be found here, but shell-fish may be had in plenty; there are also other fish to be caught. Whales sometimes frequent these shores, but not in any great numbers. Wild beasts, birds and reptiles are said to abound, hence a visit to the island should be conducted with caution.

In the account of Lord Anson's voyage, by Richard Walter, published in 1776, there is a description of Coiba island, in the following terms. It should be premised that the anchoring place of the squadron was in Damas bay:—

“The island of Coiba is extremely convenient for wooding and watering, since the trees grow close to the high-water mark, and a large rapid stream of fresh water runs over the sandy beach into the sea: so that we were little more than two days in laying in all the wood and water we wanted. The whole island is of a very moderate height, excepting one part. It consists of a continued wood spread all over the whole surface of the country, which preserves its verdure all the year round. Amongst other wood, we found abundance of cassia, and a few lime trees. It appeared singular to us, that, considering the climate and the shelter, we should see no other birds than parrots, paroquets, and mackaws; indeed, of these last there were prodigious flights. Next to these birds, the animals we found in most plenty, were monkeys and iguanas, and these we frequently killed for food; for, notwithstanding there were many herds of deer upon the place, the difficulty of penetrating the woods prevented our coming near them; so that, though we saw them often, we killed only two during our stay. Our prisoners assured us that this island abounded with tigers; and we did once discover the print of a tiger's paw upon the beach, but the tigers themselves we never saw. The Spaniards, too, informed us, that there was frequently found in the woods a serpent, called the flying snake, which, they said, darted itself from the boughs of trees, on either man or beast that came within its reach; and whose sting they believed to be inevitable death. Besides these dangerous land animals, the sea hereabout is infested with numbers of alligators of enormous size.

Whilst the ship (*Centurion*) continued here at anchor, the Commodore, attended by some of his officers, went in a boat to examine a bay which lay to the northward; and they afterwards ranged all along the eastern side of the island; and in the places where they put on shore, in the course of this expedition, they generally found the soil to be extremely rich, and met with great plenty of excellent water. In particular, near the north-east point of the island, they discovered a natural cascade, which surpassed, as they conceived, everything of this kind they had ever seen. It was a river of clear water, about 40 yards wide, which rolled down a declivity nearly 150 feet in length. All the neighbourhood of this stream was a fine wood, and even the huge masses of rock which overhung the water, and which, by their various projections, formed the inequalities of the channel, were covered with lofty forest trees.”

Rear-Admiral Sir George Seymour has remarked of Coiba island, "It is about the same size as the Isle of Wight. Off the points, ledges of rocks generally extend; but there is an appearance of an anchoring-place in the intervening bays on the east side, along which I proceeded in the *Sampson* steam-vessel. The soil on the coast is good, but the interior is nearly inaccessible from the steepness of the cliffs and tangled vegetation. We found traces of pearl-divers having visited the shores; but there are no inhabitants (1847) except at the small islet of Rancheria, between which and the north-east end of Coiba there is good anchorage. A Frenchman, of the name of Sorget, is resident on Rancheria; and this situation, as far as I could judge on a cursory view, seems more favourable for an establishment than any we saw on the larger island."

Tides.—When Coiba island was visited by navigator Colnett, in 1794, the flood came from northward, flowing seven hours and ebbing five, and the perpendicular rise of the tide was 2 fathoms.

Hicarons.—Southward of Coiba are the Hicarons, two small islands lying north and south of each other, being separated by a narrow channel. The small island, the southernmost, about a mile in extent, is entirely covered with cocoa-trees; and the large one, $3\frac{1}{2}$ miles long, bears an equal appearance of leafy verdure, but there are very few trees of the cocoa kind. Hicaron is 880 feet high, and the most extensive look-out, says Captain Colnett, is from the top of this island, for it commands Coiba and the whole of the coast and bay to the northward. The small island is known as Hicarita. The approximate geographical position of the south point of the southernmost island is lat. $7^{\circ} 12' 40''$, long. $81^{\circ} 47'$.

The channel between Hicaron and Coiba is about 4 miles wide, and has an irregular depth of 6 to 10 fathoms. It is clear of sunken rocks; but as there are some dangers near the south-east point of Coiba, it will be more prudent to pass southward of the islands than to attempt the passage within them. The principal danger to be avoided is the Hill rock, a small patch of 6 feet water, lying 2 miles S. $\frac{3}{4}$ E. from Barca island, a small islet close to the shore of Coiba, and $5\frac{1}{2}$ miles E. $\frac{3}{4}$ N. from David point, the eastern point of Hicaron island; close to this rock are soundings of 10 to 15 fathoms, so that it is very dangerous.

Rancheria, &c.—Off the north-east point of Coiba island are several islets and rocks. The largest islet, named Rancheria, is $1\frac{1}{2}$ miles in length, and lies about $1\frac{1}{2}$ miles from the shore, from which it is separated by a channel of 7 and 8 fathoms, but, as there are several rocks in this passage, it will not be prudent to attempt to run through.* North-eastward of this, about $4\frac{1}{2}$ miles, are two smaller islets, named Afuera and Afuerita, which are surrounded (for a very short distance) by rocks. A reef extends from the south-east point of Afuera, the larger island, about 2 cables; at its extremity is a black rock, almost covered at high tide.

Contreras.—This group is about 10 miles northward from Coiba, and is composed of two principal islands surrounded by many small islets and rocks. The northern island is named Brineanco, the southern Pajaros. Among them there is no good anchor-

* There is good anchorage S.S.E. of Rancheria, opposite a sandy beach, whence wood and water can be easily procured from the island. Some shelter is furnished by a high round island.

age. The *Obligado* anchored north of Brincanco in 1854, opposite a little bay in which were anchored the boats of some pearl and turtle fishers, and found the bottom very bad for holding, although composed of gravel.

Vessels may approach the Contreras without hesitation if due precaution be taken, as it is believed that there are no sunken dangers among them, the positions of which are not shown by breakers. The soundings immediately around them are 80, 85 and 40 fathoms, the latter being close to their south-west side, and there is a clear channel between the two large islands in which the depth is 98, 21, and 94 fathoms. At about 2 miles south from the islands is the Prosper rock, a pinnacle having the appearance of a black tower; although this rock is steep on all sides, it will be prudent not to attempt to pass between it and the islands on account of a reef partially dry at low tide situated about midway in the channel.

Secas.—This group of islets and rocks is situated nearly 15 miles from the coast between Pueblo Nuevo and David bay. About and among them are no known sunken rocks, the positions of which are not usually indicated by breakers. Here there is good shelter for small vessels, and upon some of the islands a landing may be effected, but there is very little inducement to go ashore as no water can be obtained. If the approach of night or failure of wind oblige a vessel in their vicinity to anchor, the best anchorage is in 10 to 12 fathoms on sand.

At about 8 miles eastward from the Secas is a dangerous rock named Bruja, which is almost awash at low tide. The position of this reef makes it a very formidable danger, especially at night; there are soundings of 20 to 24 fathoms close around it.

Mentuaa.—This little island is situated about 22 miles westward from Coiba island, its approximate geographical position being lat. $7^{\circ} 28'$, long. $82^{\circ} 14\frac{1}{2}'$. It rises to a considerable height, and has its summit covered with cocoa and other trees. A narrow reef, above and under water, extends from it about 8 miles in a north-westerly direction, and a reef also runs off from its south-east side. Captain Colnett landed here in 1794. He mentions that the bottom on the south side of the island, and also the shore near the sea is rocky. A sandy beach was found behind some little creeks between the rocks which afforded a safe landing for boats.

Ladrones.—These are two islands situated about 15 miles southward of Parida island, their approximate geographical position being about lat. $7^{\circ} 52'$, long. $82^{\circ} 25'$. They are barren, of moderate height, and together are not more than a mile in extent. They should be approached with caution as sunken rocks may exist in their vicinity. The only known dangers are some rocks about a mile northward of them, and a reef is reported to lie 4 or 5 miles from them in the same direction, upon which at low tide is a depth of only 6 feet; as the position of this latter is uncertain, and as it is only shown by breakers when there is a stiff breeze, it must be very carefully guarded against.

GULF OF DULCE.—*Point Barica*, the extremity of the land on the south-east side of the gulf of Dulce, appears like an island at a distance, and may be readily recognised, whether seen from south-westward or south-eastward. It advances seaward considerably from the main land, and its summit rises into three hills of apparently equal height and distance from each other. A nearer approach brings into view the low point which terminates it; this also resembles an island from a distance. At rather more than a

mile from its extremity is a high isolated rock, serving as an excellent object for recognition when making the land from seaward ; in the channel between, and also around this rock are breakers, upon which account it will be prudent for vessels to give it a wide berth. Point Burica is sufficiently lofty to be seen in clear weather from a distance of about 85 miles ; in its vicinity the flood tide sets N.W. with some strength, hence it is recommended to avoid being becalmed on its south-east side.

From point Burica the coast trends about 12 miles in a north-westerly direction to point Platanal, at the entrance to the gulf of Dulce. It is bold throughout, especially at point Platanal, where the mountain immediately over it rises to the height of 2,380 feet, and faces the sea in an almost perpendicular cliff. This mountain is succeeded in a northerly direction by a moderately flat country, not visible from a distance, hence the cause of the land between points Burica and Platanal appearing like an island from seaward. It is said that in all this coast there is but one place where a landing can be effected, and that is in a little rocky creek into which a rivulet falls.

With a westerly wind it will be advisable to give the coast just described a wide berth. Although not absolutely unsafe, the sea in its vicinity is very deep and rocky. At 2 miles from the land the lead fails to touch the bottom, sounding 80 fathoms, and with a strong wind from south-westward breakers of extreme violence are to be met with in-shore. For these reasons, vessels bound into the gulf of Dulce are advised to bear away for cape Matapalo, the western side of the gulf, after making point Burica ; within the cape is good anchorage and a more moderate depth of water.*

The gulf of Dulce extends into the land about 40 miles in a north-westerly direction, with an average width of 14 to 10 miles. It is but little frequented, and until 1852 was almost unknown to Europeans ; at that time its population consisted only of 12 to 15 families located at point Arenitas, on the west side of the gulf. Its soil is extremely fertile, and it is asserted that its navigation is by no means difficult. It possesses numerous excellent anchorages, and there are no known sunken dangers at a greater distance from the land than a mile, with the exception of the bank facing the river Coto, on the east shore, at about 15 miles within the entrance ; this is the principal danger in the gulf, but as the sea almost always breaks upon it, and its position is well indicated by the soundings in its vicinity, there is but little difficulty in avoiding it.

Cape Matapalo, on the west side of the entrance to the gulf of Dulce, is high, precipitous and covered with trees ; where the trees have fallen on the steep slopes the soil has a reddish appearance. This cape is the south-eastern termination of the high land Sal-si-puodes, which can be seen from a considerable distance ; hence, with the high land terminating at point Burica, the situation of the gulf of Dulce is well marked. At about a mile from the cape in an E.S.E. direction there is a rock 10 to 12 feet high, known as Matapalo rock, which stands out prominently from the coast, and when viewed from south-westward or north-eastward, appears very conspicuously ; it is safe to approach, but as there are breakers between it and the land, vessels should always

* It is probable that the width of the entrance to the gulf is not so great as represented on the charts. The distance between point Platanal and cape Matapalo is reported by many observers to be not more than 10 miles.

pass it on its south side. The coast on the opposite side of the gulf is believed to be clear of all outlying dangers, but what are visible.

All the western shore of the gulf consists of a flat well wooded country, sandy to the village of Arenitas, and afterwards alluvial. At about 6 miles northward from Matapalo rock is point Sombrero, from which a reef extends about half a mile; and 8 miles farther in the same direction is Tigrito point, also having a reef from it to the distance of three-quarters of a mile—these reefs are the only known dangers on the western side of the gulf which vessels have to fear in the approach to Arenitas from southward.

Punta Arenitas.—At about 9 miles from Tigrito point is Punta (or point) Arenitas, a low sandy projection of the coast, the greater part of which is covered with trees. The houses which formerly stood on its extremity have been destroyed by an earthquake, and the inhabitants, numbering about 400, have established themselves a little farther north and have named their village Santo Domingo. At about a cable eastward from the point is a coral bank, which partially dries at low tide; this bank has an extent of only 2 cables from east to west, and as its eastern edge is so steep that soundings of 14 to 12 fathoms may be obtained close to it, more than ordinary care is required when approaching the point. Small vessels may pass between this bank and the shore, the narrow channel having a depth in it of 16 to 18 feet; it is necessary to use the lead.

When approaching Punta Arenitas from cape Matapalo, the sea is too deep for anchorage until point Tigrito is approached, the average soundings being 35 to 30 fathoms. Off this point (Tigrito) is anchorage in 18 to 16 fathoms, sand and shells; or farther out in about 20 fathoms, green mud. At Punta Arenitas there is anchorage either N.W. or S.E. of the point; the latter is preferable if it be intended to remain only a short time, on account of its exposure to the sea breeze and the consequent freedom from the excessive heat felt northward of the point. The best position for anchoring south-eastward of the point is at about a mile from the land in 10 to 12 fathoms, green mud, with the flagstaff (1852) bearing W. by N. $\frac{1}{4}$ N., and point Tigrito S. $\frac{1}{4}$ E.

The anchorage north-westward of the point is very good, and convenient for effecting general repairs; but, if it be necessary to heel the vessel over, the Golfito, on the eastern side of the gulf, will be found a far more suitable place. The depth is 16 fathoms at a third or half a mile from the land, on green mud; eastward and northward of this position the soundings are 33 to 55 fathoms.

The landing place at Punta Arenitas is on its north side, at the entrance to a little creek which is dry at low water. The point is almost as steep as a quay. No water can be obtained here to supply a vessel, but sufficient may be got from the river Tigre, 5 miles north-westward from it; when off this river it is advisable to send ashore at half-flood, that the stream may be ascended as far as possible, and it is recommended to leave the river at half-ebb; because the sea falls rapidly. It is high water at Punta Arenitas on the days of full and change of the moon at 8h. 15m.; the highest rise of tide observed was 12 feet.

When the *Brillante* was at Punta Arenitas in 1852, a small quantity of fresh provisions was obtained from the village. Cattle could only be procured from the hacienda of Tigre. The neighbouring forests were ascertained to be rich in spars, and timber suitable for building purposes. Fish was abundant.

Point Tigre.—From Arenitas to point Tigre the distance, as before observed, is 5 miles in a north-westerly direction; the coast between, covered with mangroves, is so steep that at about a quarter of a mile from it the depth is 15 to 30 fathoms, on sand. This point is formed by a mud bank, dry at low water, which extends out about half a mile. It is on the north side of the point that the little river Tigre, already alluded to, falls into the sea.

From point Tigre to El Rincon, the head of the gulf, the distance is 17 miles, along a shore destitute of any objects sufficiently remarkable to be mentioned. At 5 miles from the point is the little river Aguja, which has, or had, a hut at its entrance; and 9 miles from this is Palma point, a very slight projection of the land, recognised by its two cocoa-trees, which are the only trees of the kind on all the coast from point Arenitas. The river Rincon is $3\frac{1}{2}$ miles from Palma point; it has two entrances which can only be entered by boats.

The soundings between the rivers Tigre and Aguja are not so deep as those southward of Tigre point; but they increase in depth as Palma point is approached, and also towards El Rincon, the head of the gulf.

At El Rincon the coast suddenly turns N.E. by E. $\frac{1}{2}$ E. and trends in that direction 11 miles, when it changes to E.S.E. and maintains that line of bearing throughout almost the whole of the east side of the gulf. In a very considerable part of this coast the mountains rise almost from the sea, and are covered with impenetrable forests; this description of coast prevails so far as the Golfito, when the mountains recede from the shore, and are succeeded by an almost flat country. At the head of the gulf, at not more than half a mile from the north shore, are some islets, surrounded by coral banks.

River Esquinas.—On the north-east side of the gulf, distant 4 miles from the islets just mentioned, is the small river Esquinas, which falls into the sea through a marshy plain. Fronting it is a bank of mud and sand (soil brought down in rainy seasons), which extends from the shore about $1\frac{1}{2}$ miles and is for the most part dry at low tide. A channel into the river has been reported as existing across this bank, but in 1852 the bank was dry over the whole of its extent; there may therefore be a channel only during floods in the interior.

From the river Esquinas the coast trends $4\frac{1}{2}$ miles south-eastward to point Esquinas and is bold all the way; the soundings met with in succession are 8 to 10 and 10 fathoms at a very short distance off it, the latter being close to the point. From this headland to point San José the distance is $9\frac{1}{2}$ miles in an E. by S. $\frac{1}{2}$ S. direction, passing at about midway a bold projection of the land; around point San José are rocks, off which is a pearl fishery at the depth of $6\frac{1}{2}$ to 10 fathoms. From this point to the entrance of the Golfito the distance is about 4 miles.

When running down the coast from the islets to the Golfito, it is advisable to give the shore a good berth, as it has not been very closely examined. The soundings close to the land are represented as deep, which the mountainous nature of the country in its immediate vicinity would lead one to infer.

Golfito.—This is an inlet of irregular shape running into the coast about $8\frac{1}{2}$ miles, the upper or south-eastern part of which is very shallow. The entrance is well defined

on the *north* side by point Golfito, a high bold promontory having a depth of 6 fathoms close off it, and on the *south* side by a hill 790 feet high having at its base a low sandy peninsula; the latter is very narrow, and has, or had, a few cocoa trees upon it. The entrance is about a third of a mile wide, and is in the direction of N.E. by N.; at first the depth is 13 to 7 fathoms, being shallowest off the southern shore, and thence it gradually decreases to $4\frac{1}{2}$ fathoms as the extremity of the sandy peninsula is approached. Immediately within this sandy spit, on its south side, the soundings are $4\frac{1}{2}$ to 2 fathoms, and vessels may enter, if care be taken to use the lead frequently to avoid any shallow spot that may have escaped the detection of the surveyors. If unfortunately it be necessary to heel the vessel over to repair, it may be done in the Golfito, as there are many places suitable for that purpose. Squalls and heavy rains are very prevalent here.

The regular winds of the gulf make the navigation of the channel leading into the Golfito comparatively easy, and with the land-wind vessels can leave it without difficulty. There is anchorage in mid-channel in about $4\frac{1}{2}$ fathoms. If desirous to anchor eastward of the peninsula, it will be advisable not to do so northward of the house on its extremity bearing W. by N. $\frac{1}{2}$ N.

River Coto.—From the Golfito the shore trends $7\frac{1}{2}$ miles S.E. by E. to the river Coto, and afterwards 15 miles south-eastward and westward to point Banco, the latter portion of coast forming the bay of Pavon; it is low and sandy throughout, and backed by a flat well timbered country. The river Coto is the most considerable stream that falls into the gulf. It is said to have two entrances, 5 to 6 feet deep with sufficient water therefore for the admission of boats, but fronting it is a bank, already alluded to, which renders approach to the river difficult; this bank extends from shore about 2 miles, and lines the coast northward as far as the entrance to the Golfito, its breadth gradually decreasing as it approaches the sandy peninsula into which it ultimately merges. The sea, even in calm weather, generally breaks on the bank; hence, although its outer edge is very steep, it can usually be avoided without difficulty.

In Pavon bay the soundings at a mile from the shore are 5 to 8 fathoms on sand. Vessels may anchor there, but only in very fine weather, and with the wind from eastward.

Point Banco is bold and steep, but not so lofty as point Platanal 6 miles south from it. It is well wooded, and at its base are some rocks too near the land to be dangerous except to vessels close in shore. At about a mile south from it is a little stream, named Claro. It is advisable to give the coast between points Banco and Platanal a good berth, as it is believed that rocks extend off it a short distance.

Point Sal-si-puedes.—From cape Matapalo the coast trends W.N.W. 15 miles, and then westward about 4 miles to point Sal-si-puedes, a high precipitous point. It is low and sandy all the way, but immediately behind, it is high land, visible from a considerable distance. Except in very fine weather it is unadvisable to approach this coast closely, the sea off it being deep, and there being usually extremely heavy breakers upon the beach; in some parts there is no bottom, sounding 50 fathoms, at less than half a mile from the shore.

Choncha Pelona.—At about a mile southward from point Sal-si-puedes there is a

round bare rock named Choncha Pelona. It is possible that there may be a clear passage between this rock and the shore, but as such has not been ascertained it will be advisable for vessels to keep outside it; it is believed that deep water exists at a very short distance from its south side.

Corcovado Rock.—From Sal-si-puedes point the coast trends in a north-westerly direction $1\frac{1}{2}$ miles to point Llorena. At about midway between the headlands is the Corcovado rock, which is 88 feet high, and viewed from a moderate offing, stands out very prominently from the coast; it is apparently joined to the shore by a sunken ledge which is probably the seaward termination of a bank fronting the small river Sirena. It will be prudent when passing the Corcovado to give it a wide berth, as the locality has not been closely examined; at $1\frac{1}{2}$ miles south-westward from it the depth is 14 fathoms, and it is said that there is no bottom at 80 fathoms at a short distance southward from it.

When approaching the Corcovado rock from north-westward, it is strongly recommended to avoid the coast between it and point Llorena, as the bottom is extremely irregular, and the low sandy coast presents no prominent marks to prevent a vessel getting too near.

Point Llorena.—This is a high, steep, and almost perpendicular headland, well wooded, and partially covered with a luxuriant vegetation; it will be easily recognised by a fine cascade which falls from one of its cliffs. At a short distance from it are some islets and rocks, some of which are well covered with shrubs.

From point Llorena the coast runs 6 miles in a northerly direction to point San José, a bold, bluff headland, having it is believed, deep water at a moderate distance from the rocks at its base; this point may be recognised from a good offing by a spot on it bare of trees. At about midway is point San Pedro, a cliffy projection having rocks about it under water. At nearly $1\frac{1}{2}$ miles from this part of the coast is a little rocky islet, named San Pedro, which is covered with trees and has sunken rocks about it extending seaward a cable or more. As this little islet is probably joined to the shore by a rocky ledge, it will be prudent when running down the coast to keep westward of it, giving it at the same time a wide berth. The islet and reef shelter a little bay under point San Pedro, the situation of which, in 1852, was further distinguished by a rock with a single tree on it, and also by the huts of the native Indians.

The beach on the south-east side of point San José is bordered with cocoa and banana trees. Boats can land here under the rocks extending from the point.

Cano Island.—Off this part of the coast, at about 10 miles distance, is the island of Cano, which is about a mile in extent from E. by N. to W. by S., and half a mile across. It is covered with trees, and the surface of the island is so level, that their summits present from a distance the appearance of almost a horizontal line. Its west extremity is surrounded by a reef under water, extending out, it is considered, about half a mile; upon account of which, and also because the current sets strongly upon it, vessels should give this end of the island a wide berth;—so steep is this reef that close to its edge is a depth of 15 fathoms, and at a cable from it 88 fathoms. The north-east point of the island has also some rocks about it, above and under water.

The landing place on Cano island is on a sandy beach at its north-west side. In

stormy weather, with a strong wind from westward, it will be imprudent to attempt to go on shore, as these winds always bring a heavy sea.

In the channel between the island and the shore there is no known danger. The depth midway is about 35 fathoms, which diminishes gradually eastward and westward; it is perhaps less deep nearer the land than the island.

When steering from the island southward towards point Llorena the bottom becomes very irregular, as the soundings change suddenly from 27 to 32 fathoms; but near the point it again becomes regular. Northward of a supposed line joining the island to point San José, the lead brings up a green compact sand; southward of the line this sand is mixed with fine sand and broken shells.

River Aguja.—Following the shore from point San José about 3 miles, we meet with the little river Aguja, which can be entered by boats. This is the only stream on the coast between the gulfs of Dulce and Nicoya, whence water can be obtained with facility.

Sierpe Bay.—From the river Aguja, a high wooded shore, fronted by a narrow beach, trends northward 5 miles to Sierpe bay, where is a little river. The bay is surrounded by high land, and can be recognised from an offing of 8 miles by a large bare part called the *rastrado*. The soundings across the entrance to the bay are 16 to 18 fathoms, on green sand of considerable tenacity.

The north point of Sierpe bay, named *Violine*, is a bold and rugged projection of coast. Off it is an islet covered with trees; around this islet is a sunken rocky ledge, which may possibly extend to the shore,—hence, vessels should always pass this islet on its west side, giving it a wide berth.

Sacate Islet.—At about 2 miles from *Violine* islet in a N. by W. direction, is a little islet named *Sacate*, which is distant nearly 3 miles from the nearest shore. It is believed to be surrounded by a rocky ledge.

Point Mala de los Indios.—From point *Violine* the coast bends sharply round eastward and forms the little bay of *Violine*, into the north side of which the rivers *Guajumal* and *Matapalo* fall. It then trends northerly 19 miles, suddenly turning to the westward near point *Mala de los Indios*. All this land is low, well-wooded, and in the interior marshy; it contains several rivers, which, in succession from the *Matapalo*, bear the names of *Brava*, *Chica*, and *Coronada*. The coast is believed to have no sunken dangers off it, and it is asserted that the soundings in its vicinity are regular, averaging 15 to 10 fathoms at 3 to 2 miles from shore; the bottom is, however, as might be expected, shallower in the immediate neighbourhood of the rivers.*

Point Mala de los Indios is bold and rugged; at a mile south-westward from it the depth is 16 fathoms. This point is the commencement of some high land, the *Cerro de Ubita*, which extends along the coast in a north-westerly direction; from this circumstance it is easily recognised, and especially too, as the land eastward and southward of it is low.

From point *Mala de los Indios* the coast trends 7 miles in a north-westerly direction

* It is probable that all the rivers on this part of the coast are in some way connected in the interior, as it is stated by the natives, that a canoe entering the river *Sierpe*, at point *Violine*, can rejoin the sea at point *Mala de los Indios*.

to point Ubita, and is in general bold and cliffy. At rather more than 2 miles from point Mala de los Indios, a cluster of rocks above water, named Ballenita, will be recognised by their peculiar form, being slender in shape and pointed. Outside these, at a mile more to seaward, is a large rock, the Ballena, covered with guano; it is surrounded by a rocky ledge, which extends from it some little distance in a W.S.W. direction, and should consequently be approached with care;—it is said that the sea always breaks upon this ledge.

Point Ubita has some rocks jutting off from it, and these are followed by a reef, under shelter of which, in what is called port Ubita, vessels of any size, it is said, may obtain shelter. Boats can land here without difficulty, and water may be procured from a river which here falls into the sea by two mouths, one eastward and the other westward of the point.

Point Dominical, distant $6\frac{1}{2}$ miles from point Ubita, is easily distinguished by its dark appearance, owing to the peculiar vegetation that covers it. The various projecting points between are well wooded, and there are several creeks of little importance. A wide berth should be given to the coast hereabout as sunken rocks exist, as far out as $1\frac{1}{2}$ miles. At 2 miles westward from point Dominical the depth is 20 fathoms, muddy bottom, and here vessels may anchor in fine weather, or nearer the shore, according as it may be convenient; the ground is good for holding.

Point Quepos, &c.—Point Dominical is succeeded by a low sandy coast which trends 17 miles in a W. by N. $\frac{1}{4}$ N. direction to point Naranjos, a bluff projection, and this again is followed by a low coast for a distance of 4 miles to point Quepos. In this extent there are four rivers, named Dominical, Barru, Savagrè, and Naranjos, the last mentioned being on the east side of the point of that name; none of these can, we believe, be ascended for any distance even by canoes. The Savagrè is the most important of the rivers, and its banks are the most visited by the Indians.

The coast between points Dominical and Naranjos is believed to be clear of sunken dangers. It is stated that vessels may run along it at the distance of 2 miles in a depth of 19 to 24 and 27 fathoms, green mud. A nearer approach than this should not be made, the locality having been only very imperfectly examined.

In the vicinity of Naranjos point is a group of islets, having sunken rocks about them; the largest and easternmost is of reddish colour. At a mile outside these islets the depth is 25 to 27 fathoms, mud.

Quepos point is of moderate height and covered with trees. On its west side are some rocks situated some distance from the land, under shelter of which boats may anchor. In the immediate neighbourhood of this point, between it and Naranjos point, are some islets of similar character and appearance to those described in the preceding paragraph; the largest, Manuel Antonio, shelters a small sandy creek, which is occasionally a resort for turtle fishers. There is no passage between these islets and the land.

Point Mala.—From Quepos point to point Mala or Judas, the coast trends westerly about 24 miles, and is low and flat the whole distance. At about a mile from Quepos point is the little river Veija; 2 miles from this is that of Las Damas; and $5\frac{1}{2}$ miles farther westward is the river Pirri. These rivers are of no value to shipping. Upon

the whole of this coast the surf beats with great violence, rendering a landing almost impossible with a strong southerly wind. The soundings at 2 miles from shore are 12 to 16 fathoms, fine sand, which increase as point Mala is approached, and the sand becomes mixed with mud.

Point Mala is very low, and covered with trees and mangroves. A reef extends from it in a southerly direction about $1\frac{1}{2}$ miles, upon which are some islets and rocks. The bottom in the immediate vicinity of this reef is very irregular, changing suddenly from 18 to 11 fathoms on a bottom of coarse sand and broken shells. When rounding the point, more than ordinary care is required, there being no objects on shore by which the position of the outer part of the reef may be known; the current off it is always westerly, but varies in strength from 1 to 2 miles an hour, according to the wind. It will be prudent not to get into a less depth hereabout than 30 to 25 fathoms.

From point Mala a low sandy coast continues in an almost straight line $6\frac{1}{2}$ miles in a N.W. by W. direction to a bold headland known as point Guapilon, the termination of the high land which at only $8\frac{1}{2}$ miles N.E. by N. from it rises to the height of 2172 feet. All this coast has a shoal extending from it some distance, causing breakers in blowing weather. At about half a mile off the headland there is a dangerous rock, awash at low water, known as Escollo rock; on account of which it will be prudent not to approach the coast hereabout nearer than the depth of 24 fathoms. At 2 miles north-westward from point Mala is the little river Tusulubre, the position of which is readily recognised.

Port Herradura.—From point Guapilon the coast maintains the direction of N.W. by W. for $8\frac{1}{2}$ miles to a little bay named Herradura, where good shelter may be obtained from all winds except those from westward. It is formed on the north side by a bold rocky point, from which a reef extends nearly 8 cables; and on the south side by a similar point of land, but bolder, as it consists of a rounded hill with very high land immediately behind it. Attached to the south point by a reef dry at low tide is an islet, named Cano, which is nearly of the same height as the point; this islet has also a reef extending about a cable from it on all sides. When the bay was surveyed in 1852, the islet was covered with trees.

Port Herradura has an extent east and west of about $1\frac{1}{2}$ miles, and is $1\frac{1}{2}$ miles wide from shore to shore. The soundings decrease from 20 fathoms at the entrance to 5 and 4 fathoms close to its head. It is, or was, uninhabited, and as it offers but few inducements for a visit, vessels seldom resort to it. Good water in great abundance may be obtained from a stream which falls into its north-east part; it is said that 20 casks may be filled at a time, if they are rolled into the basin. Communication with the interior is very difficult.

The only known danger in port Herradura is a rock, named Havannah, situated in nearly the middle of the bay, upon which the sea breaks at half-tide. It has a depth over it of only 2 feet at low water spring-tides and is sometimes visible when there is a swell. It lies with a house on the beach bearing N.E. $\frac{1}{2}$ N. $\frac{1}{10}$ of a mile, and Cano pinnacle S.W. by S. $\frac{1}{10}$ of a mile. At full and change of the moon the tide rises $8\frac{1}{2}$ feet.

When running into port Herradura, it should be remembered that the reef on each

side is very steep. Having entered, the usual place of anchorage is off the watering place, in about 5 fathoms. The approximate geographical position of the watering basin is lat. $9^{\circ} 38' 30''$, long. $84^{\circ} 36'$.

GULF OF NICOYA.—This large gulf is one of the most important places of resort on the west coast of Central America. It extends about 50 miles into the land in a north-westerly direction, and is 25 miles wide at the entrance—between port Herradura and cape Blanco, but it soon begins to decrease in width and at its head is only 6 miles across. It contains numerous islands, all lying off the western shore, some of which are of considerable extent; most of these are covered with trees, and in 1852 were uninhabited. Chira, the largest island, is at the head of the gulf; vessels of very light draught of water can sail round it, but as the channel is intricate, it is necessary to obtain the assistance of some one having a knowledge of the locality. San Lucas island, immediately opposite Punta Arenas, has good anchorage on its north side, to which vessels may run with facility. At present, 1867, the only place of trade is Punta Arenas, on the east coast, at about half-way up the gulf.*

East coast of the Gulf.—From Herradura point the coast trends northward about $2\frac{1}{2}$ miles to point Sucia, off which a rocky ledge extends westward one mile, and partly shows at low tide; close to the outer edge of this ledge, there is deep water of 18 to 25 fathoms. Thence the coast turns round to N.E. $\frac{3}{4}$ N. $4\frac{1}{2}$ miles, and then trends north-westward, 10 miles, to Calderas bluff, a high rocky point, eastward of which is port Calderas, formerly the principal port in the gulf, but now deserted. Calderas was generally considered to be unhealthy to all new residents, and the higher authorities usually managed to excuse residence.

Punta Arenas.—From Calderas bluff the coast trends round to the north-westward 8 miles, to Arenas point, off which a bank of $3\frac{1}{2}$ and $4\frac{1}{2}$ fathoms extends $2\frac{1}{2}$ miles in a southerly direction, having a small spot of 10 to 12 feet upon it; this spot lies with the extremity of the point bearing N. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles, and the Pan de Azucar W.S.W. $\frac{1}{2}$ S., $8\frac{1}{2}$ miles. The bank is very steep on the western side, deepening suddenly from 7 to 22 fathoms; but not so on the eastern side, the soundings from it to the eastern coast being 5 to 8, 9 and 7 fathoms.

Arenas point has a shelf of mud extending about a mile westward from it, which is awash at low water. It forms the south bank of a small stream, which has its outlet immediately northward of it. On the north side of this river there is another shelf of mud, which also becomes dry at low water. Upon this point there is a small *fixed* light, the visibility of which is reported (1878) to be very feeble.

Punta Arenas was once a free port; but since January 1861, customs' duties, &c., have been collected. It is (or was) the most important commercial place on the Pacific coast of Central America; and it is the only port of the State of Costa Rica, on the Pacific, frequented by vessels. During recent years it has greatly deteriorated, owing to the partial filling up of the harbour and the restrictive policy of the present Government.

* When bound into the gulf of Nicoya, shipmasters should provide themselves with the Admiralty chart No. 1931, as it shows the navigation on a large scale.

The village of Punta Arenas, has, we believe, a population of about 1500. The inner anchorage, named the *Estero*, situated northward of the point, admits at high tide vessels drawing 10 to 13 feet, and can be entered only with a pilot's assistance. The outer anchorage, southward of the point, will accommodate all ordinary vessels, the depth being 5 to 7 fathoms; but this anchorage, being exposed to southerly winds, can be considered safe only during fine weather or with the wind from the land.

The anchorage usually selected during the fine season, from November to June, is immediately southward of the point, with the Pan de Azucar bearing about S.W. $\frac{1}{4}$ W., or Aves islet S.W. The vessel will here be at about a mile from the beach, in $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms on fine muddy sand, and in a position to communicate freely with the village. In winter it is necessary to anchor farther out, on account of the inconvenience occasioned by the heavy rollers sent in from the south-westward, which tend to carry the vessel on shore. The position recommended is in $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms, mud over sand, with the custom-house bearing N.W. by N., or the lighthouse N.N.W., and the Pan de Azucar about W.S.W.*

It should be remarked that the soundings which in the passage from the Nigretas islets to the anchorage decrease gradually from 20 and 17 fathoms, to $4\frac{1}{2}$ fathoms on the bank bounding the anchorage, increase again towards the eastern coast to 10 and 9 fathoms. In the immediate vicinity of Calderas bluff, the depth is 15 to 12 fathoms.

When at anchor it is recommended to moor S.E. and N.W. The holding ground is not good, and the anchors are liable to be fouled by the flux and reflux of the sea, and by the moving of the vessel during the sea and land breezes.

It is high water on the days of full and change of the moon at 8h. 10m. The tide rises about 10 feet.

Water for shipping is obtained at the river Baranca, 7 miles eastward from the anchorage. The bar can be crossed only at half-flood, or a little before half ebb. The best water is obtained at about a mile from the entrance. Only boats can ascend the river, and the channel is very tortuous. The vessel should be anchored at about $1\frac{1}{2}$ miles from the river, in $6\frac{1}{2}$ fathoms.

We believe, abundance of fresh provisions can be obtained at Punta Arenas, but some difficulty may be experienced in obtaining cattle.

West coast of the Gulf.—Cape Blanco, the west extreme of the gulf of Nicoya, is of moderate height and covered with trees even to the beach. The land, of which it is the southern termination, is sufficiently high to be visible from a distance of about 25 miles, especially when bearing about N.N.W. At a considerable offing it somewhat resembles an island, but a nearer approach reveals some white spots which help to distinguish the cape from the back land. At about a mile southward from it is an islet, of light colour, without verdure. This islet is surrounded by a rocky ledge, which dries at low tide, and has deep water of 10 to 30 fathoms immediately southward of it; between it and the shore the depth is $4\frac{1}{2}$ to 9 fathoms.

* Mr. Hull, R.N., H.M.S. *Havana*, 1859 says "the light at Punta Arenas is plainly visible southward of the Sail rock. By not bringing it eastward of N.N.W. vessels will be clear of all danger till the anchorage be reached. We came to in 6 fathoms, with the lighthouse bearing N.N.W. $\frac{1}{4}$ W., distant 6 miles. Both ebb and flood set strongly over the Punta Arenas bank."

From cape Blanco, the western side of the gulf trends 11 miles to the N.E. by N., and is free from outlying dangers, except that at about $2\frac{1}{2}$ miles from the cape, a ledge of rocks, partly above and partly under water, runs one mile off the shore, and has deep water of 17 fathoms close to its outer edge. At the end of this distance, 11 miles, the coast bends a little inwards, forming a small bay, named Ballena, where are soundings of 18 and 9 fathoms, shoaling gradually towards its head, which is low land covered with mangroves. The north side of Ballena bay, Ballena head, is of moderate height, and steep, having 14 fathoms at a short distance from it. Thence the coast trends N.E. $\frac{1}{2}$ N., about 8 miles to the Nigretas islands, and there are, at about midway, two islands separated from the shore by a narrow channel navigable by boats, named Jasper and Alcatraz, of which the former is the easternmost. The Nigretas are two islands close to each other, which run off $2\frac{3}{4}$ miles from the coast; from the eastern one a ledge of rocks extends a quarter of a mile eastward, and has near its extremity a large rock known as the Sail or Ship rock.

From the Nigretas islands the coast trends to the N.N.W., $6\frac{1}{2}$ miles, and has several islands off it, lying more or less near the shore; of these, the largest, about two miles westward of Nigretas islands, is named Cedro. At the end of this distance are the islands Aves, Pan de Azucar, and San Lucas; these are surrounded by shoals to a short distance, but separated from each other by soundings of 7 to 11 fathoms.

The channel up the gulf northward of San Lucas islands, between them and the bank extending from point Arenas, has a considerable width and depth of 18 to 27 fathoms, muddy bottom. Thence up the gulf, and failing a pilot, the eye and steady use of the lead will be the best guides.

Directions.—The entrance to the gulf of Nicoya is so wide that no difficulty whatever is experienced in making it. It is usual to steer for cape Blanco, keeping a little eastward of its meridian, and afterwards to direct the course into the gulf; but it appears probable that some advantage would be gained if the land about Herradura were made instead of the cape, as the effect of the westerly current would thereby be to some extent neutralised,—a mile or two would also be saved in the subsequent route to Punta Arenas.

Having entered the gulf, keep along the eastern shore, as it is shallower than the opposite coast, and also because the effects of the ebb stream, which southward of the Nigretas islands flows south-westward, will not be so strongly felt. The soundings, although great, are not so deep, but that the anchor can be let go in the event of being overtaken with a calm and a contrary current. The flood has occasionally considerable strength, and requires to be guarded against as its tendency is towards the Nigretas islands, in the vicinity of which the water is very deep; close to the south side of the Sail rock the depth is 24 fathoms, deepening rapidly seaward to 86 fathoms. The course thence to Punta Arenas is direct and clear of any known sunken danger. The bank extending southward from the point has already been mentioned.

The following instructions were written in 1819, and are added because they supply some useful hints:—

“The entrance of the gulf is safe; the tides, however, at times run strongly, especially at the fall and change of the moon. There is ebb and flood, but the former is of longer continuance and much stronger than the latter.

To run in, keep eastward of the meridian of cape Blanco, which is the westerly part

of the gulf; and should you round the cape at the distance of 1 to 3 miles, the course will be about N.E.; or, if you should be about half-way between the cape and port Herradura, the eastern side of the gulf, it will be a little more northerly.

Having sighted the Nigretas, on the port bow, a rocky point will be observed a little eastward of them, having the appearance of a vessel, and hence called the Ship rock, to which give a good berth, leaving it on the port hand. Haul then over to the starboard coast, that in the event of it falling calm and an ebb tide, you may anchor in shallow water; whereas, if becalmed, with an ebb tide, when near the Ship rock, it would be difficult to find anchorage, at least in not less than 20 to 80 fathoms; and if unable to anchor, the ebb tide, which is very strong in this part of the gulf, would drive the vessel back again past cape Blanco. Steer along the starboard coast, so as to pass the extreme points at a distance of from 2 to 8 miles, and you will soon perceive the custom-house of Punta Arenas, towards which shape your course, and as soon as the village is seen, bring the custom house to bear N.N.W., or the middle of the village N. by W., when you will be in from 18 to 8 fathoms, and see in the distance the point named Punta Arenas. Farther out there is a heavy breaking of the sea, occasioned by some sand banks, which run out a great distance, and partly dry at low water. Westward of these banks are the islands of San Lucas; eastward of which, between them and the banks, there is good anchorage, but in deep water.

Merchant vessels prefer lying closer in, on account of the proximity of the landing-place and stores. The course indicated above leads ships to this anchorage. The leading mark is the custom-house on with the flag-staff of the port. The depth is about 8 fathoms, muddy bottom, at from a half to 3 cables from the shore.

The banks above alluded to have a tendency to augment and change their position, and the safest course is to keep the custom-house a little open eastward of the flag-staff, keeping the lead constantly going; and should the water shoal, to haul immediately to starboard. If desirous to come to anchor on heaving a ship to, at some 2 or 8 miles from the port, in order to obtain a pilot, it may safely be done, until one comes off and carries you to the place desired.

The custom-house is easily known by its white painted roof; but it should be carefully borne in mind that, from the rapid progress the sea appeared to be making upon this spot, it may soon be removed and another built elsewhere."

It has been stated that ships from southward should make cape Blanco, to obtain a fresh departure for their intended port. Such is the course recommended by the writer of the foregoing directions, who considers it better than to make a direct course for the volcano of Beija, because in winter the winds are light, variable, and attended with calms, and it is frequently the case that the high land is obscured by mists or haze, which renders navigation difficult even to those well acquainted with the coast.

Geographical Position.—The approximate position of cape Blanco (islet off the cape) is lat. $9^{\circ} 33'$, long. $85^{\circ} 4' 10''$.

The COAST from cape Blanco trends north-westward and westward nearly 40 miles to a point of land named Morro Hermoso, from which a reef extends a short distance; afterwards it bends round to N.W. $\frac{3}{4}$ N., 28 miles to point Velas, so named from its resemblance to a sail, off which are some islets and rocks. It is recommended to give

all this land a good berth, to avoid any sunken dangers there may be; for it has not been closely examined. It is represented to be, in general, high land covered with trees, with occasionally some sandy plains and small deep bays. From point Velas the coast trends 14 miles north-eastward to point Gorda, the south-west extremity of Culebra bay.*

The coast between points Velas and Gorda is quite unknown. It is said to have some islands off it, the outermost of which is named Brumel. Point Gorda, viewed from southward, appears as a great rounded hill with a slight indentation in the middle of its summit; it is higher than the country in its vicinity and its highest part is near the sea.

CULEBRA BAY.—Port Culebra, the north-eastern part of Culebra bay, is an inlet running about 4 miles into the coast, in a north-easterly direction. At its entrance it is about a mile wide, with soundings of 10 to 20 fathoms, which depth increases gradually towards the head of the bay, where there are 9 to 6 fathoms. On the south side of the entrance are some islets, or rocks, at a short distance from the shore, called the South Viradores; and on the north side are also two similar rocks, called the North Viradores. Captain Sir E. Belcher observed the head of the bay to be in lat. $10^{\circ} 36' 55''$, long. $85^{\circ} 38' 30''$. After mentioning various difficulties experienced in finding the port, he describes it in the following terms:—

“At daylight on Sunday, the 25th of March, 1838, we were close off the port, but not being able to detect the Viradores, we wore, and intended running further south; as Kellet had informed me that, in his search for me, he had been unable to find it.

While in the act of wearing, a gleam of sunshine showed an island in-shore, which induced me to make another attempt, and on reaching to windward we opened the heads and discovered the Viradores; but even then could only ascertain from the mast-head that any recess of the bay lay within. At noon we entered the heads, and at 3h. anchored in 8 fathoms in this splendid port, justly deserving that appellation.

The port is certainly magnificent, and, from information derived from the natives, I learned that it is connected with Salinas, and thence on to Nicaragua, Granada, &c. If any railway be contemplated in this quarter, it ought to enter at the bay of Salinas,

* The coast westward of cape Blanco as far as Culebra bay is very imperfectly represented in charts, as the delineation is chiefly derived from a sketch obtained during a running survey by Capt. T. A. Hull, R.N., in 1859. M. Lapelin of the French surveying vessel *Brillante* in 1852, gives the name of Guiones to a point of land 30 miles W.N.W. from cape Blanco, which we suppose to be the Morro Hermoso of Hull's chart, although the latter is there represented 8 miles farther westward. M. Lapelin approached cape Blanco from westward and observes “All the coast between points Gorda and Guiones is high and wooded and bordered with a strand of white sand interrupted here and there by cliffs of reddish colour having rocks at their base over which the sea breaks. We coasted it at the distance of 2 to 3 miles, and had soundings of 24 to 27 fathoms. Point Velas is unknown to the pilots. In the positions assigned to points Velas and Morro Hermoso we found neither point nor hill; it was only in lat. $9^{\circ} 53'$, long. $85^{\circ} 52'$, that is to say, in a position 21 miles more south and 12 miles more west than that assigned to point Velas, that we met with a greyish coloured cliff surmounted by trees, and having breakers at its base to the distance seaward of apparently 14 miles. The sea broke upon some detached rocks, which lie in a considerable number southward of a white sandy islet, upon which are two rocks resembling sails at a distance. Having from this point run along the coast about 20 miles in an E. by S. direction, we discovered that the land then trended S.E. to cape Blanco. All this coast is steep and covered with trees; the hills were seldom more lofty than those of the country behind the cape; and the sandy beach interspersed in many places by rocky points which formed little sheltered bays, offered great facilities for a landing.”

which would render these two ports important. When this portion of the country becomes settled, civilized, and more populous, I little doubt but Culebra will be better known, and probably the chief port of the state of Nicaragua.

Water, fit for consumption, was not found at the beach, but may be obtained a short distance up the creek, which a boat may enter at high water. If wells were dug, doubtless it would be found at the N.W. side, and the surrounding country is mountainous. Another indication in favour of this is the thickly wooded sides and summits, as well as bright green spots of vegetation throughout the bay.

Brasil wood is very abundant. Mahogany and cedar were observed near the beach, but, as people have been employed cutting the brasil, probably all the mahogany and cedar, easily attainable, has been taken."

From port Culebra the coast trends to the N.N.W. about 20 miles to cape Elena, northward of which are Elena and Salinas bays. All this shore is quite unknown and as usually represented in charts is believed to be very badly delineated; it is said to have some islets off it of considerable size. Cape Elena is an elevated promontory of a triangular form, the ridge of the promontory being very irregular in outline, having a somewhat serrated aspect, while its northern side is an unbroken steep escarpment without any indication of verdure.

Murcielagos Islands.—On the southern side of the remarkable cape just described is a cluster of islands, known as Murcielagos or Bat islands. They are but imperfectly represented on the chart, as little is known concerning them. Two rocks extend seaward of them more than a mile in a westerly direction, hence they must be cautiously approached. These islands form almost two distinct harbours; in the inner one vessels can anchor in 82 fathoms, with a hawser fast to the shore. Springs are numerous and there are tolerable rivulets, where fresh-water can be obtained; but the surf is very great, and gulf squalls are frequent and violent.

About 8 miles north-eastward of cape Elena is the point of the same name; whence the coast trends easterly and then northerly, forming the bay of Elena.

Elena Bay.—Elena bay is an open bay having an extent from north to south of about 4 miles; at its head in its south-east corner, is a small inlet of 11 to 4½ fathoms, named Tomas bay, in which vessels might perhaps be able to anchor and obtain protection from westerly winds,—but this is uncertain. Elena bay is quite open to all winds from westward. Off the entrance of Tomas bay, at about a mile from the shore, are some rocks above water, known as Vagares; and at about 2 miles N.N.E. from these is the small island, Juanilla, inside of which is a depth of 7 to 11 fathoms. The north shore has also an islet off it, named Despensa. The water in this bay is very deep, there being 80 fathoms at 2 miles from its head; whence it shoals gradually to Juanilla island. As there is good anchorage in Salinas bay vessels seldom enter Elena bay.

SALINAS BAY, northward of Elena bay, is separated from it by a bold headland, terminating in point Descarte. It is a little more than 3 miles in extent, with soundings of 12 fathoms at the entrance, which decrease gradually to 4½ and 2 fathoms at its head, on sand and mud. The northern shore is high land; the southern is comparatively low and flat. In the south part of the bay, at a short distance from the

beach, are some rocks above and under water; and near the centre of the bay is a little island, named Salinas, under shelter of which vessels anchor during winter, and find protection from westerly winds. The geographical position of Salinas island, according to the determination of Capt. Sir E. Belcher, R.N., is lat. $11^{\circ} 2' 50''$, long. $85^{\circ} 39' 9''$.

When bound into Salinas bay it is advisable to give a wide berth to point Descarte, because reefs are said to run off from it, in a westerly direction, upwards of a mile. A good mark is the north peak of Orosi, 5200 feet high, situated about 12 miles inland, bearing E. $\frac{1}{2}$ S. (S. 83° E.), as this will lead to the bay. The depth on the south-east side of Salinas island is shallow for nearly half a mile.

The Coast from Salinas bay to San Juan bay trends $12\frac{1}{2}$ miles in a N.W. $\frac{1}{2}$ W. direction; it has not been surveyed, and should have a wide berth given to it. Cape Nathan, in lat. $11^{\circ} 8'$, has some rocks off it above water, and there are also some similar rocks at about midway between this point and San Juan; all these rocks lie off the land at a considerable distance, and as there may be sunken dangers in their vicinity, it will be prudent to avoid approaching near them.

Mountains.—In approaching from seaward considerable assistance in discovering port San Juan is afforded by the mountains Mombacho (4482 feet high), Ometepe (5050 feet), Madera (4190 feet), Orosi (5199 feet), and Miravalles (4700 feet). Mombacho, in lat. $11^{\circ} 48\frac{1}{2}'$, long. $85^{\circ} 54\frac{1}{2}'$, bears a strong resemblance to the volcano San Salvador (in lat. $18^{\circ} 49'$, long. $89^{\circ} 10'$), but is not sufficiently lofty to be seen from all directions by an observer at only a few miles from the land. The pointed summit of Ometepe, in lat. $11^{\circ} 32'$, long. $85^{\circ} 34'$, and the large saddle-shaped summit of Madera, in lat. $11^{\circ} 27'$, long. $85^{\circ} 27\frac{1}{2}'$, can be seen in clear weather above the hills between them and the coast. The volcano Orosi, in lat. $10^{\circ} 59'$, long. $85^{\circ} 25'$, is frequently obscured by clouds; when not so hidden it will be recognised by its double pointed summit, which resembles the pointed roof of two towers, connected by a vast ridge. Miravalles, in lat. $10^{\circ} 39' 40''$, long. about 85° , can also be seen from almost all directions seaward. From San Juan, the summit of Ometepe bears N.E. by N., and that of Madera N.E. $\frac{1}{2}$ E.

SAN JUAN DEL SUR.—The bay of San Juan del Sur is small, being only about half a mile across. It is situated in about lat. $11^{\circ} 16'$, long. $85^{\circ} 49'$, and is by no means easy to find, even when running down the coast, the little bays being all of similar character and appearance. High land surrounds the bay on every side, excepting towards the S.S.W. and W. by S. quarters, in which directions it is open to the ocean. At its head the beach is low and sandy, and on each side the land juts out towards the sea, forming promontories of 400 to 500 feet high. The entrance from the sea is clear, with a depth of water of 9, 8, 7, and 6 fathoms, decreasing gradually to 3 fathoms at the distance of 300 yards from the beach. In every part there is moderately good anchorage, generally on a muddy bottom; and the rise of tide is from 10 to 14 feet.

The prevailing winds on this part of the coast are North and N.E., which blow occasionally with considerable violence; and when such is the case, vessels may sometimes experience some difficulty in making the bay. Fresh-water can be obtained at a short distance from the beach. The nearest town is Nicaragua which is distant 7 or 8 leagues.

Directions.—Vessels approaching the port of Juan should bring the conical peak of Ometepe (which rises 5050 feet out of lake Nicaragua, 22 miles distant from the coast) to bear N.E. by N., and run in on that bearing till the peak is hidden by the coast range; they will then have the harbour ahead, distant about 5 miles.

Coming along the coast from the southward, when within 5 or 6 miles of the port, three isolated rocks will be observed standing off the coast, apparently about one mile apart, and when near the entrance, which is bold on either side, a small house near a large tree may be seen on the hill over the right-hand side of the bay.

The usual anchorage is in 5 to 6 fathoms near a large iron buoy moored in 5 fathoms opposite the town.*

At the distance of less than a mile from San Juan del Sur, there is another port named Nacascolo, which is of nearly the same size and figure; and, as the land between them is low and nearly level, they might be united by a cut, were it thought necessary.†

M. de Lapelin, 1852, does not write favourably of the bay of San Juan. "It is usual to anchor outside the port in 8½ to 11 fathoms, nearer the south than the north side of the bay, and always close to a little bed of rocks which reduces the breadth of the entrance. The bottom, consisting of sand and broken shells, is a very indifferent holding ground against the violence of north-east squalls, and its sharp declivity towards the sea still further increases the difficulty of the anchor retaining its hold; this declivity is, however, of some advantage during the prevalence of West and S.W. winds, which sometimes in winter blow with considerable violence. At this outer anchorage, with on-shore winds, the loss of a vessel is unknown, although instances have occurred of vessels dragging their anchors.

The port consists of a little bay open to all winds from seaward. The bottom, of the same description as the exterior anchorage, does not hold better, and as the anchoring ground is very limited in extent, it will be prudent not to enter the bay but remain outside. Except perhaps in winter, small vessels may, however, obtain shelter behind the rocks of the north point.

It is not difficult to effect a landing, as boats ground at some little distance from the beach and the surf is not very heavy.

Water is obtained from a well, and is of indifferent quality; it is small in quantity and not easily got. With the exception of fresh provisions at an extravagant price, we could obtain no supplies."

GULF OF THE PAPAGAYOS.—The portion of coast described in the preceding paragraphs, from Port Culebra to the bay of San Juan del Sur, or perhaps as far northward as cape Desolad. (see page 50), is known as the gulf of the Papagayos; these are violent winds, which blow with such considerable strength as frequently to cause the loss of spars and rigging.

They commence about the meridian of Leon, long. 86° 50', and when approaching

* Capt. G. F. Emmons, U.S. steamer *Oostpee*, 1860.

† The government of Nicaragua decreed in about the year 1840, the erection of houses and the buildings necessary for making San Juan bay a port of commerce, but in 1852 there were only a few wooden buildings pompously called hotels.

from westward, are first felt off cape Desolada, about 10 miles eastward of Realejo. They decrease about sunset, and attain their greatest force about nine or ten o'clock in the morning.

Captain Sir E. Belcher, R.N., says of this wind or breeze, that its limits may be considered to be included in a line drawn from cape Desolada to point Velas; and it is rather a curious phenomenon, that its strength seldom ranges so far as this chord, but seems to prefer a curve at a distance of 15 to 20 miles from the land.

Captain Marie says "In this part of the coast and as far as the entrance of the gulf of the Papagayos, the winds are very light, with frequent calms; the tides setting strong from the N.W. Custom recommends steering along the coasts in the gulf, as by so doing it is thought that the squalls are less severe, the winds more steady, and the sea much smoother. I have frequently crossed the gulf, sometimes close in shore, and at other times been forced, by strong winds from N.N.E. to N.N.W., to keep the offing. In the summer time I have navigated in this locality both near to, and at a distance from the coast, and in both cases met with strong winds, accompanied with sudden and heavy squalls, which are almost immediately followed by calms; great care is therefore necessary. I have always taken the precaution to keep from one to three reefs in the topsails, taking care promptly to shorten sail when the squalls came on, and then keeping as close to the wind as possible, with a good full sail, so as easily to make cape Desolado, and have thus been enabled to cross the gulf with this sort of weather in about 12 or 15 hours. The winds generally enable ships to make a N.W. course, but in order to keep in with the coast it is desirable, as the squalls subside, to steer, if possible, a little to windward of that point."

M. de Lapelin states "In the gulf of Papagayos, and on other parts of this coast, northerly gusts come without any announcement, being felt suddenly with a cloudless sky equally as when there is a calm or fog. In accordance with the opinions of most navigators, I consider that it is better to keep along the land at the distance of 5 or 6 miles than to get out to sea, because at this distance the gusts, although perhaps more sudden, have less strength and have not such long intervals between them—sometimes indeed these intervals did not exist at all, and instead of them is met a continuous breeze freshening every moment. If the opinion of Sir E. Belcher, R.N., be correct that the gusts prevail most at the distance of 15 to 20 miles from land, it follows that if the shore cannot be coasted at the distance of 5 or 6 miles, it would be better to keep outside at about 80 or even 45 miles from land; the gusts will there to a considerable extent lose their force and become less sudden, the sea also will not be so heavy and trying. As the vessel advances northerly towards the coast, the direction of the wind becomes more easterly, and it is often possible to reach Realejo in a direct course without tacking."

THE COAST.—From San Juan del Sur to Tamarinda river the coast trends about N.W. $\frac{1}{2}$ W. 75 miles; it is somewhat bold but remarkably little undulated, and it contains here and there sandy creeks* and cliffs against which latter the sea breaks with violence. This coast is very imperfectly known, but it is believed that, with the exception of the

* Brito, a small bay about 8 miles northward from San Juan, has been proposed as a terminus of a canal from the lake of Nicaragua. Northward of Brito are several similar small bays of little importance.

Industrie rock, a 15-foot patch lying $8\frac{1}{2}$ miles off shore, in lat. $12^{\circ} 4' 40''$, long. $86^{\circ} 48' 10''$, there are no detached sunken dangers, beyond the distance of one to $1\frac{1}{2}$ miles from the coast. In the vicinity of Tamarinda the coast is described as drowned land, being of a much lower elevation than that to the southward or northward.

Within the coast just described are the great lakes of Nicaragua and Managua, and near the head of the former will be seen the volcano of Mombacho which bears a close resemblance to that of San Salvador, being a rounded mountain whose summit rises to a peak.

TAMARINDA.—The river Tamarinda, situated in lat. $12^{\circ} 9\frac{1}{2}'$, about 28 miles S.E. by E. (*true*) from Corinto (Realejo), is one of the principal places in Nicaragua, whence Cedar wood is shipped. The depôt, composed of a few huts, lies 6 or 7 miles within the entrance of the river. It can be reached at high water springs by vessels drawing nearly 20 feet, but great caution is required as the bottom is rocky and very irregular. Outside the entrance the depth is 4 to 6 fathoms; here vessels may anchor, but only during fine weather, as it is extremely dangerous during the bad season. The entrance-channel is considerably narrowed by sand-banks, also by two rocks, the northern of which is covered at high water.

If intending to enter the river a vessel should first moor close in shore, and, while waiting for wind and tide, place buoys, &c., to indicate the channel. When proceeding up the river it will be necessary to tow or warp to the trees. In the channel the least depth is 15 feet; the rise of tide 8 to 12 feet. At springs the flood-tide is very violent.

Supplies.—Besides fresh meat, which can be obtained only once a week, no provisions are obtainable, and water cannot be procured without much difficulty.

THE COAST.—North-westward of Tamarinda the coast becomes gradually more elevated, forming an extensive escarpment (*rideau*), known as *Costa Tosca*, which has the appearance of having been scorched by a tropical sun. *Costa Tosca* is succeeded by a low sandy shore, which continues until the cliffs of cape Desolada are reached in lat. $12^{\circ} 21'$, long. $86^{\circ} 58' 51''$.* The whole extent of this coast is noted to be extremely unhealthy.

Between Tamarinda and cape Desolada there are three small loading places, the most important of which is that named San Martin. This small port is about 10 miles from Tamarinda and consists simply of a few huts, abreast which vessels can anchor in 10 fathoms water, good holding ground. Communication with the land is very difficult in consequence of the surf which exists continually.

Abreast the coast at Tamarinda the soundings appear to indicate the existence of a flat bottom of 16 fathoms depth. At 6 miles off *Costa Tosca*, the bottom, consisting of mud, has a depth of 16 to 18 fathoms, falling suddenly to 22 fathoms a short distance farther off. Northward of Tamarinda as far as San Martin, rocks extend off shore to the distance of a mile. (*Description of coast here given is uncertain.*)

Cape Desolada may be recognised by its desolate appearance. Its rocky cliffs, though

* This position of cape Desolada is in accordance with the description of the coast given by French navigators. According to English charts cape Desolada is situated about 80 miles farther southward, in about lat. $12^{\circ} 1'$, long. $86^{\circ} 37\frac{1}{2}'$. See *Instructions Nautiques* (549) *sur les côtes ouest du Centre-Amerique et du Mexique*, by M. A. Pailhès, 1879, pp. 83—85; also *Annales Hydrographiques*, vol. xl., 1877, pp. 898—897.

not of great height, are steep; and, as rocks extend seaward from them a distance of about 4 miles a wide berth should be given them by passing vessels. On the western side of the point is (or was in 1852) a little *plateau*, with stunted trees upon it, and its south-east side is of reddish colour and bare of vegetation. As cape Desolada is approached the sandy beach will be observed to be bounded in some places by little wooded cliffs, while in other parts rocks extend out a short distance into the sea.

From cape Desolada to Castanon bluff the coast is very low and sandy, but well wooded. It is believed that there are no detached dangers lying off it, with the exception of the Conway,* a dangerous reef situated about three miles south-eastward of Castanon bluff, in about lat. $12^{\circ} 25'$, long. $87^{\circ} 5'$. In this locality the bottom, which consists of sand and mud, is much deeper the same distance from shore than to the northward of port Corinto (Realejo), there being soundings of 10 to 22 fathoms at a distance of only 2 to 6 miles from the shore.

Mountains.—The mountains in the vicinity of Realejo are very lofty and visible from many miles at sea; they are known as the Marabios mountains. Commencing with Momotombo on the shore of lake Managua, which is said to be 6000 feet high, they advance almost parallel to the coast and terminate in that named Coseguina, on the south-east side of the gulf of Fonseca, which is estimated to have an elevation of 8800 feet. When viewed from the sea off Realejo, at an offing of some miles from the land, at least eight of these remarkable mountains can be seen at one time, supposing the weather to be favourable; of these Viejo and Momotombo are very conspicuous and easily recognised not only by their great height but by their form and position. The peaks in succession from Momotombo are Axusco, Las Pilas, Orotá, Telica, Santa Clara, and Viejo.

Viejo mountain appears in the offing opposite Realejo as a magnificent cone, having a perceptible cavity at its summit; it is 5557 feet high, and apparently rises from other mountains, of which the smallest and westernmost has a well marked conical form. Momotombo, an active volcano, is a lofty mountain whose sides are at a very sharp angle; it rises from lake Managua, forming as boldly and well defined as a pyramid, and hence cannot fail to be recognised at once, especially as it terminates the chain of mountains in an easterly direction. When viewed from the sea at some distance southward of Realejo, Momotombo appears as an immense isolated mountain, but when seen from Cardon island it is joined to Axusco, a volcano of less height, the two mountains then revealing themselves as perfect cones.† Las Pilas, 8015 feet high, has two rounded summits of almost equal height which give its top a saddle-shaped appearance; it is not sufficiently lofty to be seen from the offing; this volcano became active in 1850, after remaining quiet many years, a crater having then opened at its base. Telica is

* The Conway reef should have a wide berth given to it, as the bottom in its immediate vicinity is so very irregular that there may be dangerous sunken rocks near it. If the west point of Cardon island be kept open of Castanon bluff, about N.W. $\frac{1}{4}$ W., it will clear it in 7 fathoms on its south side; this is quite close enough to approach the reef.

† In the lake Managua, near Momotombo mountain, is an island which rises into a mountain of conical form, named Momotombita. This is of much less elevation than Momotombo and not visible from the port of Realejo, but it is very distinctly seen over the land, when advancing southward along the coast. The two mountains are similar in shape.

the most remarkable of the mountains between Las Pilas and Viejo; it is a cone of extremely regular outline, which appears to be connected to Viejo, of which it has about half the altitude, but from which it is in reality separated by a wide interval containing the mountain Santa Clara;—on the eastern side the mountain Orotá is between it and Las Pilas.

Having obtained sight of and recognised these mountains, it is easy to make the port of Corinto (Realejo), even from a considerable distance in the offing, for both Viejo and Momotombo are visible at about 60 miles from land. If Viejo is brought to bear N.E. by N., and kept thus in approaching the coast it will lead to Cardon island, which is sufficiently high to be visible from a distance of 7 or 8 miles, where are soundings of 38 to 45 fathoms. When Viejo is recognised, if it should be on a bearing eastward of N.E. by N., a course should be steered to get Momotombo on the bearing of E. $\frac{1}{2}$ N., or Telica N.E. by E. $\frac{1}{2}$ E., either of which will also lead to the port.

If it should so happen that the mountains are hidden by clouds, it is necessary to make the land south-eastward of the port, somewhere in the vicinity of cape Desolada, because of the current which is almost always to the N.N.W.* The coast should then be followed in about 10 fathoms water, and care should be taken as Corinto (Realejo) is approached, to keep the west point of Cardon island well open westward of Castanon bluff, to avoid Conway reef; on getting nearer the port the same end of Cardon island should not be brought westward of North on account of the Castanon shoals.

CORINTO (REALEJO).—Port Corinto, or Realejo, formed by the outlet of two rivers named Realejo and Telica, is situated in about lat. $12^{\circ} 28'$. It is without doubt one of the best harbours on the whole Pacific coast of Central America. It is protected from the force of the sea and winds by the peninsula of Castanon (on the southern side); also by the islands of Cardon and Asserradores. The beautiful basin (*estero*) within has soundings of 4 to 8 fathoms over the greater part of it. The land on each side of the entrance for some distance is low and wooded; that south-eastward of it, close to the sea, is higher than that to north-westward, but its elevation is not more than 80 feet, and Castanon bluff is only 40 feet high.

Cardon Island, in front of the port, divides the entrance into two channels, the Cardon on the north and the Barra Falsa on the south. This island is about three quarters of a mile long and a cable broad at the south end, whence it increases a little in width towards its other extremity. Though its greatest elevation is only 30 feet above the sea, it appears high when compared with the surrounding low land. Its north-west part, cape Ponente, appears of a brownish red colour; on the side towards the land are cliffs, which are almost perpendicular. When viewed from some distance in a S.S.E. direction the north-west extremity of the island has the appearance of a huge rock separated from the island by a narrow channel. Viewed from seaward Cardon island appears not unlike a wedge, of which the highest part will be the cliffs just alluded to. Its western end consists of a sandy beach, and at its southern extremity are some

* This is chiefly necessary in the months between November and May, as the usual winds are then from north-eastward and blow occasionally with considerable violence out of the gulf of the Papagayos; at such times a strong current sets along shore to the north-westward.

detached rocks. In 1852 there were only a few trees on its north and east parts, the remainder was covered with little shrubs. These trees formed a valuable means of distinguishing the island from Manzana, an islet off the coast a few miles north-west of Corinto, which otherwise so closely resembles it as to be called the False Cardon. The lighthouse, lighted in 1875, also affords an excellent means of recognising the true island.

Light.—A fixed white light is exhibited from an octagonal wood lighthouse, painted white, erected on Cardon head, the north-east point of Cardon island. The light is 64 feet above the sea and visible 12 to 15 miles. Its geographical position is lat. $12^{\circ} 27' 55''$ long $87^{\circ} 7' 4''$.

Barra Falsa.—This, the southern channel into Realejo harbour, is now partially filled up (1875) and only fit for boats; it lies between Cardon island and Castanon bluff. The latter will be easily recognised because it is the western part of three islands running off from the main and connected to it and each other at low water by dry sand. This channel is three-quarters of a mile wide from shore to shore.

Cardon Channel.—This is now (1875) the only navigable entrance into Corinto (Realejo) harbour. It lies round the north end of Cardon island, between it and Asserradores island, and is nearly three-quarters of a mile wide from shore to shore, but the breadth of the channel way is only one cable, being contracted to that width by the Sawyer bank, a shoal running off from the south-west end of Asserradores island; the channel is consequently close under Cardon head. The depth on the shoalest part of Sawyer bank is only 8 feet, and its edge is very steep, the lead at once falling from 8 fathoms into 9 and 10 fathoms; sometimes this edge is indicated by breakers, but more frequently not, for which reason and also because the tendency of the flood is towards it, additional care is required when in its immediate vicinity.

Shoal water, having a dangerous patch at its extremity named Gorgon shoal, extends out a short distance from the north-west side of Cardon island. This patch lies nearly a cable North from the rock off Ponente point, and there is a depth of about 6 fathoms close to it.*

Cardon channel should not be attempted without a pilot, and especially because there are reasons for believing that considerable changes in it have taken place of recent years. It is reported that soundings of 23 feet are to be found at low water on the bar in the channel, and it is not considered safe then for vessels drawing over 20 feet to enter. The leading mark for making the channel is, the low south end of Asserradores island well open of Cardon head, until Ponente point bears S. by W., when it is necessary to change the course to south-eastward in such a manner as to sail close round Cardon head.

Having entered the port through Cardon channel, soundings of 6 and 7 fathoms will

* Gorgon shoal or rock was discovered in 1849 by Commander J. A. Paynter, R.N., of H.M.S. *Gorgon*. It had then 11 feet water upon it, and from it the south point of Asserradores island bore N. 80° E.; Cardon head S. 87° E.; and point Ponente S. 14° W. (Variation 9° E.) To avoid this rock, steer towards the entrance with Cardon head touching Icaos point, and when distant a good cable from point Ponente stand out N.E. by N. until Castanon bluff opens out from Cardon head, then round Cardon head at a short distance, remembering that the current flows over Sawyer bank.

be found for some distance within. There is complete protection from all winds, and Cardon island and the shoals at the entrance keep out all heavy seas.

Pilots.—A pilot will proceed to sea as soon as a vessel is signalled from the lookout on the north-west part of Cardon island. Pilotage is compulsory, unless there is unreasonable delay on the part of the pilot coming off.

Corinto, the present settlement, from which the port takes its name, is situated, we believe, about 500 yards northward from point Icaos, the south-eastern extremity of Asserradores island; it does not come into view until the point is doubled. The village of Realejo, about 4 miles higher up the river, was formerly frequented by vessels; it is now, however, superseded by Corinto, in consequence of the river having become shallow and unnavigable. Corinto possesses a custom-house and several other buildings; a flagstaff will also be observed which is used as a mark for anchoring. It is in communication with Leon, a city having a population of about 8500, distant about 18 miles eastward from the port. The road leading to it, is on the opposite side of the *estero*, and faces the village. Since the establishment of Corinto, the town of Chinendega, 6 miles northward of Realejo, has deteriorated in commercial importance, while Leon has improved.

The port is capable of accommodating a large number of vessels completely sheltered from bad weather. There is never any surf on the beach and landing is easy. Vessels anchor about $1\frac{1}{2}$ cables distant from the flagstaff of Corinto, in about 5 fathoms water, ooze, good holding ground. This anchorage is extremely unhealthy during the rainy season, at which time the heat is oppressive, and intermittent fevers, of a very severe kind, are prevalent.

Provisions are scarce and of inferior quality; only such being provided as are necessary for the Pacific Mail S.S. Company, whose steamers call regularly every 14 days. If ship's stores be required they must be obtained from Leon; the prices are high. Good fresh water may be obtained at a place called Lemon, 6 or 8 miles distant from Corinto; that found at point Icaos is not considered good. Wood may be cut on Asserradores island, but care must be taken to avoid the serpents which are almost as numerous there as the sharks in the *estero*.

Exterior Anchorage.—The anchorage outside Cardon island is safe only during fine weather, consequently when it is intended to make a lengthened stay at the port it is more prudent to enter the river. A very large vessel should anchor with the north point of the island bearing East or E. $\frac{1}{2}$ N., in $6\frac{1}{2}$ to 8 fathoms, bottom of mud and black sand; if in a position more northward than this, the same soundings will be found at a greater distance from the land but not from the shoals, and if more southward a heavier sea is generally met with. This is the winter anchorage for *all* vessels.

In fine weather, vessels may anchor close in at about a mile W. $\frac{1}{2}$ N. to W. by N. from Cardon island, with Viejo mountain bearing N.E. by N.; the depth here will be $4\frac{1}{2}$ to 5 fathoms, sand and mud.

In 1852 the French surveying-vessel *Brillante* anchored here in 4 $\frac{1}{2}$ fathoms, with Viejo mountain bearing N. 34° E.; *Namotombo* in one with Cardon island N. 87° E.; Telica N. 68° E.; and the north-west point of Cardon S. 88° E.

Tides.—It is high water at Cardon island on the days of full and change at 8h. 6m. Spring tides rise 11 feet. As the river is ascended the time of high water is later; at

7 miles up the difference is 1 hour. At the outer anchorage the flood stream flows from N.E. to E.N.E. and the ebb the contrary, with a mean velocity of about $\frac{1}{10}$ of a knot per hour.

The COAST.*—From Cardon island the trend of the coast is about N.W. by W. along Asserradores island, which is low and well wooded, and has a sandy beach. A near approach to this shore is not recommended, because, if the wind should subside, the current and swell would soon drift the vessel on shore. A safe distance is 5 miles, in not less than 10 fathoms water. During winter, when the wind sometimes blows from South to S.W. with rainy weather, there is also danger in remaining at anchor off it, as the sea runs very high.

Manzana, or False Cardon island, about 12 miles N.W. by W. from Cardon island, is a small low island covered with trees, and encircled by a beach (of gravel) of a whitish colour.† The island is only 16 feet high, but the trees upon it render it visible at the distance of 8 miles; as these trees are almost of equal height their tops form nearly a level line. It terminates in a very gentle declivity, especially on its south side, where its extreme point is connected to Asserradores island by a rocky bank under water, upon which the sea almost always breaks, and over which there is such little depth that it completely closes the channel. It is dangerous to attempt this passage, even in a boat, unless in very fine weather and at nearly high water. Between Manzana and the main is another passage, even more dangerous than that just mentioned; for, although the sea in it breaks less, and consequently does not so readily show the rocks and sandy shoals, there is much less water upon them than is found in the southern passage.

It has been already stated that vessels bound to Corinto (Realejo), and unacquainted with the bearings necessary to make the entrance of that port, have occasionally mistaken Manzana for Cardon, and Asserradores for Castanon, and the passage mentioned for the entrance to Realejo, hence navigators should be cautious to avoid being deceived in the appearance of the land, and should remember that, whereas Manzana is very low and completely covered with trees, Cardon island has only a few trees on its north and east parts and a lighthouse on its north-east head.

M. T. De Lapelin of the French surveying vessel *Brillante*, 1852, remarks:—"In the event of the mountains being seen it is almost impossible to mistake Manzana for Cardon, for Viejo bears E.N.E. from the former island and N.E. by N. from the latter. Viejo is so lofty that its summit is often hidden by clouds; in such an event, the volcano of Telica, a perfect cone south of and not very far from it, whose summit is rarely concealed from view, is very useful as a mark,—from Manzana it bears East, and from Cardon E.N.E.‡"

The false entrance of Manzana, in which so many ships have been wrecked through the mistake occurring mentioned above, is fringed by a reef known as the Bubonos,

* The coast between Realejo and the gulf of Fonseca has not been surveyed, and is known to be very imperfectly delineated in charts, hence our description of it is necessarily unsatisfactory.

† The island of Manzana is called by the pilots of the country Asserradores island; and the latter is known to them as Corinto island (*Instructions Nautiques*, No. 599, p. 40, 1879).

‡ If the volcano of Telica is correctly placed on the Admiralty chart (2147) these bearings must be true.

which extends seaward from the island more than 3 miles. At its extremity are some detached rocks which never uncover. To clear this danger it is recommended not to approach the coast nearer than 5 miles, nor to go into a less depth than 11 or 12 fathoms.

Between the false entrance of Manzana and the Boca del Padra Ramos, the entrance of which is divided by an islet, the coast is skirted by a line of reefs which extend seaward a distance of 2 to 3 miles, and in which there are several passages for boats. At 4 miles from this part of the coast the soundings vary from 11 to 14 fathoms.

Speck Reef.—About 7 miles N.W. by W. from Manzana island and 20 miles S.E. by E. from Coseguina point are some dangerous outlying rocks collectively known as the Speck reef. There are in fact two distinct rocky shoals, the outer of which is distant about 3 miles from the shore and separated from the inner by a channel half a mile wide and 6 fathoms deep. The direction of this channel is S. by E. and N. by W. (*true*). The outer reef is known by the natives as the *Sequedad de Petacaltepe*; it was explored by the French surveying vessel *Vaudreuil*, in 1872, which ~~rested~~ anchored in the channel between the two shoals. The *Sequedad de Petacaltepe* is said to be extremely dangerous, as at half-tide, with a heavy swell, there are no breakers upon it, whilst the sea breaks furiously at that time on the inner reef, which uncovers at low water. Some rocky heads of 16 feet water have been found on the outer reef and the pilots state that at low water springs three small pinnacles of rock are visible, awash.

At the anchorage of the *Vaudreuil*, in 6 fathoms water, in the passage between the two shoals above described, the following *true* bearings were taken:—the centre of Manzana island S. 51° E.; Viejo mountain N. 86° E.; the Mesa de Roland N. 38° E.; and point Coseguina N. 49° W. These bearings place approximately the position of the vessel's anchorage in lat. 12° 40', long. 87° 22½'.

Mesa de Rolland, in about lat 12° 46', is the extremity of a little mountainous chain, which runs from the interior in the direction of the sea. It is easily recognised by the plateau of which its summit consists, and by the large reddish-coloured spots which occur in parts where there are no trees. Similar spots may also be observed upon another flat topped mountain, situated a little more in the interior.*

North-westward from the Rolland the land becomes very depressed and flooded, so that it has the appearance of a large *estero* (or estuary) when viewed beyond a depth of 8 fathoms water. The shores of this apparent breach in the coast are lined with breakers, towards which the soundings decrease gradually from 10 fathoms water, which depth is distant 5 miles from the breakers. Proceeding in a north-westerly direction this drowned land is succeeded by a sandy beach, which, at 6 miles from Coseguina point, gives place to steep cliffs, rising gradually in elevation as point Coseguina is reached.

Point Coseguina, the south-east point of the gulf of Fonseca, in its western and southern parts presents to the sea moderately high and almost perpendicular cliffs; its northern part is, on the contrary, very low, as it consists of a sandy beach. Vessels may safely approach it from all directions, even to within the distance of a mile, if a depth of 8 to 5 fathoms be maintained; but during the flood, this offing would not be

* If these peculiar appearances are occasioned by drought, they will most probably be *green* during the rainy season.

sufficient, as it might carry them into the Estero Real, towards which it flows with a strength of $1\frac{1}{2}$ to 2 knots.*

GULF OF FONSECA.—This is one of the most important bays on the Pacific coast of Central America, being of great extent, and remarkable both for its security and surpassing beauty. It contains two principal harbours—namely, *La Union* (or San Carlos), which belongs to San Salvador; and *Amapala*, a port belonging to Honduras. *San Lorenzo* (belonging to Honduras), on the river Nacaome, is not visited by foreign vessels. The bay, reckoning from shore to shore, has an extent of about 28 miles north and south, and of nearly 80 miles east and west; over nearly the whole of its area, wherever the depth of water is suitable, there is excellent anchorage. Although known chiefly by the name of Fonseca, it is also called Amapala, Conchagua, Coseguina, Omatapa, and San Carlos; by English shipmasters it is recognised as the gulf of Fonseca.

In the north-western part of the gulf are several islands of considerable size, of which that most to seaward is Manguera. These will be described subsequently.

The mainland is divided between the states of Nicaragua, Honduras, and San Salvador. The islands belong only to the two last mentioned states, and these are arranged as follows; Honduras possesses Amapala or Tigre, Sacate Grande or Velasquez, and Disposicion,—San Salvador owns Conchaguita, Manguera, Perez, and Punta Sacate. The islands are all of volcanic origin and extremely beautiful in appearance.

Estero Real.—At nearly 12 miles north-eastward from Coseguina point (described on page 62) is point Monypenny, which is low and swampy, and has immediately under it a lagoon. Thence the coast takes a sudden turn in a south-easterly direction, about 14 miles, to the mouth of the Estero Real, and is low all the way, but rises inland to high mountain land. This arm of the sea is fronted by a bar, having over it a depth of 16 feet at low tide; all vessels that can cross this may sail about 80 miles into the interior, and those of only 10 feet draft fully 60 miles. The depth within the bar is 5 fathoms, rapidly deepening to 6 and 7 fathoms, which is maintained for many miles. Sir E. Belcher R.N. ascended it about 80 miles in the surveying vessel *Sulphur*, and could easily have gone further, had not the strong head winds rendered the toil of towing too heavy. In reference to it he says "I am satisfied that the stream could have been followed many miles higher, and have not the slightest doubt that it is fed very near lake Managua. I saw the mountains beyond the lake on its eastern side, and no land higher than the intervening trees occurred. This, therefore, would be the most advantageous line for a canal, which, by entire lake-navigation, might be connected with the interior of the states of San Salvador, Honduras, Nicaragua, and extended to the Atlantic. Thirty navigable miles, for vessels drawing 10 feet, we can vouch for; and the natives and residents assert 60 more; but steamers will be absolutely necessary, to tow against the prevailing breezes."

Playa Grande, in the Estero Real, belonging to Nicaragua, is on the left bank of the stream, and so rarely visited as to be a place of but little commercial importance. It is merely a port occupied by a few soldiers.

* Belcher's chart represents a reef extending a third of a mile off the point; also at 8 $\frac{1}{2}$ miles farther northward a reef is shown running off the coast a similar distance.

About 8 miles within Coseguina point is the volcano of that name, notorious for its frequent emissions of dust, ashes, and water. Its summit is 2848 feet above the level of the sea, and can be seen at the distance of nearly 70 miles in clear weather. The verge of the crater is half a mile in diameter. The interior walls fall perpendicularly to a depth of about 200 feet, when the bottom of the crater becomes flattish, with a small transparent lake in the centre. The last grand eruption of this volcano occurred on the 20th of January, 1835, and was attended with the most disastrous effects.*

From the Estero Real the coast trends round N.N.W., about 80 miles, to the head of the gulf, and has soundings of $1\frac{1}{2}$ to $3\frac{1}{2}$ fathoms, at 4 miles from the shore; some dry patches lie in the direction of E. by N., 6 miles from Monypenny point.

Amapala Point.—The western side of the gulf, point Amapala, is of moderate height, and bordered by a reef of rocks and sands extending some distance into the sea, and causing heavy breakers; thus enabling it to be easily avoided. Outside the point, at a short distance, is a depth of 6 to 8 fathoms.

From point Amapala the shore bends in north-westward to the outlet of a small river, and then turns north-eastward, 9 miles, to Chicarene point, round the north side of which is port La Union.

The volcano Amapala, the summit of which is $1\frac{1}{2}$ miles inland in a W.S.W. direction from Chicarene point, rises to the height of 4840 feet. It has not the conical form so characteristic of the volcanoes in this part of Central America. It is a large mountain, with two summits contiguous to it; of which, the highest has a gradual slope and is in parts crowned with trees,—whilst the other, of a very rounded form, is covered with the herb named *Sacate*.† The second summit is the true crater of the volcano, and has been extinguished for many years; it differs little in elevation from the first.

La Union.—Immediately northward of point Chicarene is the bay forming port La Union. It extends 8 miles in a north-west direction and is about $8\frac{1}{2}$ miles broad, reckoning from shore to shore, but the whole of this is not available for anchorage, as extensive oyster beds and mud flats, dry at low water, line the northern shore, and contract the space in which shipping can be accommodated to not quite half that extent. The western and northern shores of the bay are low. The town, or village, stands on the southern shore, at about $4\frac{1}{2}$ miles from the entrance.

From the foregoing paragraph it will be seen that the deepest water in the port is off the south shore. The depth from point Chicarene to the town is (or was) 8 to $8\frac{1}{2}$ fathoms, and vessels may anchor in almost any part of it if precaution be taken not to get so close to the mud flat as to ground when the tide falls. It is common for very

* The summit of the volcano fell in; until then the mountain was almost as lofty as Viejo. It now presents so remarkable an appearance, that coupled with its near vicinity to the sea it cannot be mistaken for other mountains on the coast. Belcher gives the height of Coseguina volcano as 3800 feet, and of Amapala volcano as 3866 feet.

† The herb *Sacate* covers the whole country except where there are trees. It has a long and strong fibre, and in the dry season gives the lands covered by it a peculiar yellow appearance, so that, were it not for their great extent they might be mistaken for fields of ripe corn. As the termination of the dry season approaches the whole country covered by it is parched and arid to a degree, and then appears of a reddish colour; immediately after the commencement of the rains, this changes to a pale green colour and presents the appearance of young sugar canes.

large vessels to anchor just within the entrance in 6 to 5 fathoms, mud, before the north point of Punta Sacate comes on the bearing of East, as they are then sufficiently sheltered from the heavy seas sent in by strong winds from southward and not exposed to the intense heat prevalent further within the bay. Vessels of 800 or 400 tons generally anchor at 2 miles south-eastward from the town, in about 6 fathoms, mud, nearly midway between the town and point Chicarene.

If it be intended to remain only a short time in this part of the gulf of Fonseca, and it be not convenient to enter the bay of La Union, vessels may anchor in the channel formed by the islands Conchaguita and Punta Sacate and the coast. The best place will be at about three-quarters of a mile southward of the watering place* of Chicarene, in 6 or 7 fathoms, mud, with point Chicarene bearing about N. $\frac{1}{2}$ E., and the north point of Conchaguita S.E. by E. $\frac{1}{2}$ E. Such a berth should be selected as may place the vessel as much as possible out of the influence of the violent sea which prevails here when the ebb is opposed by a strong sea breeze; and, it is recommended to moor north and south because of the current.

The bay of La Union affords a land-locked anchorage. It is not considered desirable to take up a berth directly opposite the town, because in summer the wind occasionally blows so hard from northward, that if the anchor drag the vessel might be on shore before another could be let go. In some parts of it the holding ground is not good.

The town of La Union has a population of about 1200; it derives its importance mainly from its proximity to the city of San Miguel, which in February and November (when its fairs are held) becomes a busy commercial town. Since the creation of the port of Amapala and the re-opening of that of Libertad, La Union has lost much of its former importance. The gradual shoaling of the harbour, in consequence of the growth of the soft mud-flats, has also contributed towards its deterioration. A small wharf, or jetty, runs off the town for the convenience of boats, which are able to come along side it at half-tide. At low water landing is almost impossible, as the mud-flat uncovers far beyond the extremity of the jetty, and the only means of going on shore is by employing canoes which slide on the mud. A few provisions may be had; there are fowls and fruits, but supplies for a voyage cannot be obtained here.

Light.—A fixed white light is exhibited from the Commandant's house at the inner part of the jetty; it is 33 feet above the sea and visible 8 miles. Its approximate geographical position (according to the observations of M. Miet, commandant du *L'Hermitte*, 1874) is lat. $13^{\circ} 16' 30''$, long. $87^{\circ} 47' 10''$.

Tides.—It is high water at La Union on the days of full and change at 8h. 15m. Springs rise $10\frac{1}{4}$ feet; neaps $8\frac{1}{4}$ feet; neaps range 7 feet. The tides are regular, except in the rainy season, when the ebb continues rather longer than the flood;—at the entrance of the bay between Chicarene and the island Punta Sacate, they flow (especially the ebb) sometimes at the rate of 3 knots and cause a strong race which has

* This watering place is at rather more than a mile south-westward from point Chicarene. Although the surf here is occasionally very heavy, especially during a breeze from seaward and at full and change of the moon, water can be obtained with facility either by the hose or by filling the barrels on shore. The water is very superior in quality to that obtained from the wells of La Union.

the appearance of breakers,—in the vicinity of the town the rate is seldom more than 2 knots.

Directions.—When bound to the bay of La Union, steer for the island Conchaguita, (subsequently mentioned,) and pass it at a short distance on its west side, as you will thus avoid getting into the bay on the north side of Amapala point, towards which the flood tends. If obliged to tack there is plenty of room, but Amapala point should not be approached nearer than the depth of 10 or 9 fathoms, because of the reef which surrounds it, the edge of which is steep; as the sea usually breaks on this reef it is not difficult to avoid. It will be prudent to preserve an offing from the land at least $1\frac{1}{2}$ miles when in the vicinity of this point.

When passing through the channel between Conchaguita island and the coast it is recommended to keep over towards the shore of Amapala volcano, to obtain the advantage of the flood which here flows northward; and, this course should be followed even as far as Chicarene point, because immediately Conchaguita is left astern the flood divides into two streams, one flowing northward into the bay of La Union, and the other north-eastward between Punta Sacate and Perez islands. Some care is required to avoid a dangerous reef extending southward a third of a mile from the south-west end of Punta Sacate; but which, as it is never entirely covered, presents no great difficulty. The channel here is but little more than half a mile wide, and has a depth in the middle of 14 to 20 and 28 fathoms; having passed through this, the bay of La Union opens to view, and such an anchorage can be selected as may be convenient.

Farallones.—On the eastern side of the fairway to the bay of La Union, and just within the entrance to the gulf, is a dangerous group of rocky islets, named the Farallones, among which are some rocks under water. They lie with Monypenny point bearing East $5\frac{1}{2}$ miles, and the centre of Coseguina volcano S.E. by E., 9 miles; close to them all round is a depth of 8 to 10 fathoms.

Manguera.—Of the islands in the gulf of Fonseca this is most to seaward, it is consequently the first met with in the approach to La Union from southward. It is oval in form, and its extent from N.N.W. to S.S.E. is about $8\frac{1}{2}$ miles, its breadth being $1\frac{1}{2}$ miles. Its shores are clifty, and its summit has an elevation of about 600 feet. Close to it on the south, west, and north sides, is a depth of 6 to 8 fathoms; but its eastern side has a sandy flat of 12 to 15 feet extending from it half a mile, beyond which are soundings of 4 and $4\frac{1}{2}$ fathoms. A small rocky island, named Manguerita, lies about half a mile from its south-east point; in the channel between is a depth of 10 to 18 fathoms.

Conchaguita is the name of the island situated 2 miles north-westward from Manguera. Its extent is $1\frac{1}{2}$ mile and its form is almost circular. This island rises to the height of about 500 feet, and may be safely approached on all sides except the north-east, whence a flat 10 feet under water, extends halfway over to Perez island, and is succeeded by other shallows of similar depth. The channel to La Union bay is westward of this island, and has a depth of 6 and 7 fathoms; while the channel eastward of it, between it and Manguera (that which is usually followed by vessels bound to Amapala in Tigre island), has a depth of 11 to 9 fathoms.

Perez.—At $2\frac{1}{2}$ miles from Conchaguita in a north-easterly direction is Perez island, situated on the western edge of a $2\frac{1}{2}$ -fathom flat which extends from Conchaguita in a

north-easterly direction to Disposicion island, and thence to the shore. Close to the western side of this island is a depth of about 4 fathoms, which increases to 9 and 10 fathoms towards the shore of Punta Sacate.

As Perez island is joined to Conchaguita by a flat of only 10 to 15 feet water, vessels approaching La Union bay (the eastern side of the approach to which is bounded by the islands and flat) must take care that they do not get too far eastward, especially at low tide. The flood hereabout sets north-eastward, and therefore has a tendency to carry vessels towards the flat.

Punta Sacate is the name of the island north-westward of Perez. It bounds the channel into La Union bay on the east side, and is of irregular shape. A reef, already mentioned, extends a short distance south-westward from its south-west point. Between the island and the shore northward of it, is no safe passage, almost the whole space being occupied by a mud flat which dries at low water. At a short distance from its east side is an islet named Chiquito.

Garova, Inglesera, Disposicion, Valasquez and Tigre are islands eastward of those just mentioned. Of these, Valasquez is the most extensive; it is close to the shore, and its summit has an elevation of 2220 feet. These islands are all, more or less, situated on the extensive shallows which prevail in the northern part of the gulf, and among them are many islets and rocks of which special mention need not be made. On the north-west side of these islands is Cismuyo bay at the head of which is port La Brea, of little importance. Disposicion is the name of the island off the south-west side of Valasquez, and about $1\frac{1}{2}$ miles north-westward from Tigre; it is recognisable from a distance by its rounded summits, of which the highest has a height of about 650 feet. Tigre, the island most to seaward, has an extent of about 3 miles, and is almost circular in form. It is the highest of the islands of the archipelago just mentioned, as its summit has an elevation of 2590 feet. A bank of $2\frac{1}{2}$ fathoms extends 2 miles from its south-west side, in the direction of Manguera, leaving between it and that island a channel $2\frac{1}{2}$ miles wide, and about 4 fathoms deep; the east side of the island, in the direction of San Lorenzo bay, is so shallow that it is only for a short distance that vessels can get near it; its north side is unapproachable; consequently, it is only along its west side that an approach can be made to the port of Amapala, which lies on its north-western shore.

Amapala, since being made a free port, has rapidly grown in importance and is now more frequented by vessels than La Union. It belongs to Honduras and is the only port of that state on the Pacific coast. Its anchorage is extremely good, being sheltered from almost all winds and having good holding ground, green mud. The usual anchorage is in 7 or 8 fathoms about 4 cables distant from the shore, abreast the village, with the flagstaff bearing S. $41\frac{1}{2}^{\circ}$ E. (*true*).

Provisions are more easily obtained at this place than at La Union; a kind of market is held. Water of questionable quality can be obtained from a cistern near the shore. Among its vegetable products the chief are coffee and Indigo. The exports consist principally of cattle, hides, dye woods and other fancy woods. In general the climate is healthy, and, although intermittent fevers sometimes prevail, there is no hospital to go to. Loading and discharging cargo are carried on by means of lighters

and in general there is very little delay. Landing is easy, as the beach is sand abreast the village; it will, however, be greatly facilitated when the proposed mole is constructed.

Directions.—If, when bound to Amapala, it be intended to use the channel between *Conchaguita* and *Manguera*, steer as much as possible midway between these islands, as thereby the deepest water will be preserved; the depth will be 9 to 11 fathoms. As the north end of *Manguera* is rounded, the second hill of the summit of *Tigre* should be brought on a N.E. by E. bearing and continued thus until the shore of that island is distant about half a mile, when the channel to the port will become open; in this latter course the soundings will gradually decrease from 10 to $8\frac{1}{2}$ fathoms, on mud mixed with sand,—the lead should be kept going, especially when nearing *Tigre*.

The channel to Amapala is along the west shore of *Tigre*, between it and the extensive bank of 6 to 15 feet upon which are seated the islands *Conchaguita*, *Perez*, *Inglesera*, *Disposicion* &c., and which extends northward to the land. It is not quite three-quarters of a mile wide, and in it are soundings of $4\frac{1}{2}$ to 8 and 10 fathoms; as the channel is so limited in breadth, the lead should be freely used, and especially because the edge of the bank is steep. When running through the channel, a little islet will be observed close off the west shore of *Tigre*, to which it is connected by a sana bank dry at low water; it is named *Caracolita*, and upon it are shrubs and a few trees. A dangerous rock lies close to the westward of this islet, which must be cautiously avoided; it is (or was) guarded by a buoy. From *Caracolita* islet to Amapala the distance is about $1\frac{1}{2}$ miles, and the course is along the coast of *Tigre*, keeping off it a moderate distance; there is no other danger but what is close in to the shore.*

The channel eastward of *Manguera*, between it and the bank extending south-westward from *Tigre*, is also occasionally used, especially by vessels under 16 feet draught. From the little islet *Manguerita*, off the south-east end of *Manguera*, steer in a N.N.W. direction and keep the lead going to avoid getting on the bank extending from *Tigre* island, and as soon as *Disposicion* island bears N. $\frac{1}{2}$ W., steer for it on that bearing until *Caracolita* comes into view. When the latter bears N. $\frac{1}{2}$ E., the channel is open and may be entered and followed as before.

Tides.—It is high water at Amapala on the days of full and change of the moon at 2h. 56m. The rise of the highest tide observed was 11 feet.

At the north end of *Manguera* the flood flows in an E.N.E. direction with a strength of about a mile per hour; the ebb, on the contrary, flows between *Conchaguita* and *Manguera*, S.S.W., at the rate of $1\frac{1}{2}$ miles. It is high water here on the days of full and change of the moon at 8h. 15m.; the rise of tide is about 10 feet.

The best time to leave Amapala is at the end of the flood and with a breeze from the land; no further instructions are necessary than to reverse those already given for entering.

Mountains.—The mountains around the gulf of Fonseca are very conspicuous from the sea. Some have been mentioned in the course of the preceding remarks on the gulf, and it now only remains for us to allude to those named *Viejo* and *San Miguel*.

* When approaching the port the direction and influence of the tidal stream must not be forgotten. The flood sets northward and towards the banks.

Towering above all other mountains eastward of the gulf, will be seen in clear weather the volcano Viejo which has an elevation of 5557 feet. This mountain cannot be mistaken for others, its height is so great that it bounds the view in the eastern horizon; hence in clear weather it is a valuable landmark. When inside the gulf, in the vicinity of Manguera island, it will be observed over the bay of the Estero Real on a bearing of about S.E. by E. $\frac{1}{2}$ E.

San Miguel, in about lat. $19^{\circ} 24\frac{1}{2}'$, long. $88^{\circ} 5'$, is north-westward of the gulf of Fonseca. It rises to the estimated height of 6526 feet, and is a perfect cone having a very large base. Its summit (the crater) is almost a level, there being only a very slight concavity in the middle. The great elevation of this mountain causes it to be conspicuous above all the hills in its vicinity; when viewed from westward it appears detached from the surrounding land. It was in full activity in 1852, when its summit was frequently hidden by a white cloud.

THE COAST.—Point Amapala or Candadillo, the western limit of Fonseca bay, is encircled by a bed of rocks and sand which extends seaward about one mile. This danger is easy to avoid as the sea breaks continually over it. From Amapala point the coast trends in a westerly direction about 26 miles to port Jiquilisco, and is for a few miles fronted by a sandy beach, which is succeeded for a further distance of about 10 miles by a bolder coast, cliffy in some places; this ceases on the bearing of San Miguel mountain N. 18° E., and is followed by a low shore as far as port Jiquilisco. These sandy beaches give a very deceptive appearance to the land, especially at sunrise and sunset, at which times it does not seem to be at the distance from the vessel that it really is, and the surf also apparently breaks farther from the coast than it actually does; hence it must be approached with extra care, and especially too as it has not been surveyed, and is almost unknown. The soundings from a distance of some few miles in the offing are believed to decrease gradually to the shore, and it is stated that vessels may anchor off the coast if overtaken by a calm, which it is perhaps most prudent to do,—the currents being variable, sometimes to eastward and sometimes to westward, with a strength of about $1\frac{1}{2}$ miles an hour.*

At a mile distant from the shore the soundings are 8 to 10 fathoms until San Miguel comes on a N. 4° E. bearing, when they diminish to 7 and $5\frac{1}{2}$ fathoms at $1\frac{1}{2}$ miles off the coast.

PORT JIQUILISCO, named also Espiritu-Santo and Triunfo de los Libres, consists of a bay situated in about lat. $13^{\circ} 10'$, long. $88^{\circ} 18'$. It has not been examined, and the few particulars we possess of it are not of a reliable character. It is scarcely known in San Salvador, and it has no trade whatever. Its entrance is intricate and much obstructed by sand-banks, upon which the sea breaks heavily. These shoals extend about 4 miles seaward and are dangerous to passing vessels.† Within the

* Voyage of the *Sérieuse*, in the *Annales Hydrographiques*, Vol. 10.

† A dangerous shoal, with about 12 feet water over it, has been reported as existing off this part of the coast, in lat. $13^{\circ} 2'$, long. $88^{\circ} 19'$ (approximate). According to the statement, it is 8 miles long in a N.E. and S.W. direction, and from its centre San Miguel volcano bears N.N.E. Two vessels are asserted to have struck on it, at an estimated distance from the shore of about 10 miles. It is known as the Lempa shoal.

The existence of this reported shoal is discredited. The examinations of this locality made by

entrance are some islands, one of which, named, Pajaros, divides the bay into two parts. The average depth in the channel is stated to be about 8 fathoms; hence, if this be correct, there is water sufficient for large vessels. When intending to enter, it will be prudent to send a boat ahead to sound the passage, should it so happen that a pilot cannot be obtained.

M. Jamin of the French ship *Génie* wrote thus a few years ago:—"On the evening of the 25th January we got under way from the river Lempa, with a good S.S.E. breeze, which enabled us to run along the coast in about 8 fathoms, and at sunset we observed some breakers opposite us which appeared to extend a considerable distance from the land; we then anchored in about 8½ fathoms, soft mud. The next day we got under way again, and it was then easy to see the breakers, which extend across the Estero in the form of a horse-shoe, in such a manner that the bay can only be entered by going round them; the sea broke over them with considerable violence, but there are places among them where in fine weather there are no breakers, which might consequently be easily traversed by boats.

The depth in the deepest part of the channel at low water is 15 feet; the rise is about 9½ feet. It is therefore possible for vessels of considerable tonnage, to get within the breakers, where there is a much greater depth of water, with the exception that in two or three places there are some small banks; those may, however, be easily avoided.

The ebb current leaving the Estero forms eddy streams in which there is a good depth of water, and these eddies are also to be seen in the deepest places on the reef; hence the position of the navigable channel is well indicated. The current flows in an opposite direction with the flood,—at the rate of 2 or 3 knots at full and change, when the bar is very dangerous, except at the time of high water."

M. Lapelin of the French ship *Brillante*, 1852, says "The coast between the river Lempa and port Jiquilisco is low and wooded, but the beach, which in the neighbourhood of the river is of very white sand, becomes here of a well determined gray colour. The soundings off it at the distance of a mile are regular, the depth at that offing being 7 fathoms, on a bottom consisting of sand covered with a very tenacious slimy mud, good for holding; apparently there are no sunken dangers. Near Jiquilisco, the coast (similar in appearance to that immediately westward of it, being backed by some wooded hills, and fronted by a beach so low as frequently to be hidden by the heavy surf that breaks on the bar) is intersected by several rivers. The bay of Jiquilisco, unlike what may be remarked of the rivers Lempa, Paza &c., has not about it large mangrove trees so conspicuous with their white trunks, but clumps of thickets of a dirty pale green colour, or great bushes comparatively leafless.

We approached the breakers as near as half a mile, coasting them from West to

M. Lapelin of the French ship *Brillante* in 1852, also by M. Lefevre of the French ship *Vaudreuil*, in 1872, establish the fact that no danger exists beyond the distance of 4 miles from the coast. It is consequently considered probable that the reported shoal is one and the same as that which is known to extend about 4 miles off the entrance of Jiquilisco bay,—an opinion which is not only held by the last named surveyor but also by the Spanish pilot at San José de Guatemala.

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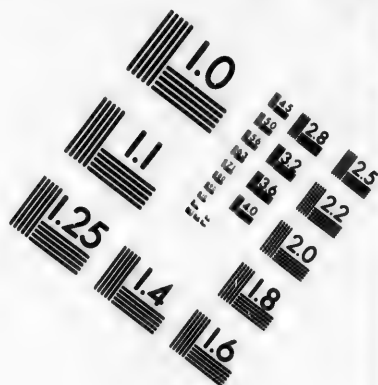
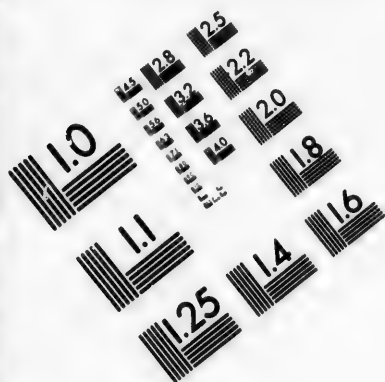
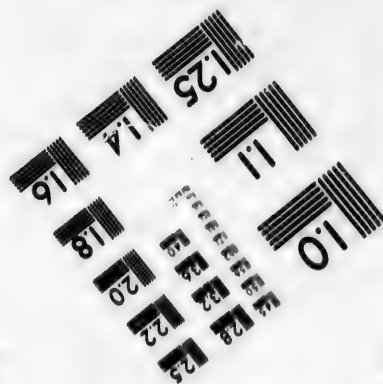
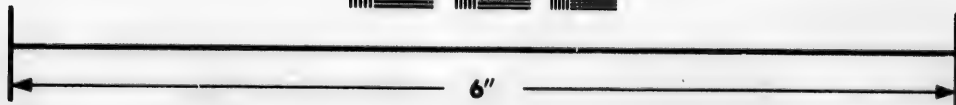
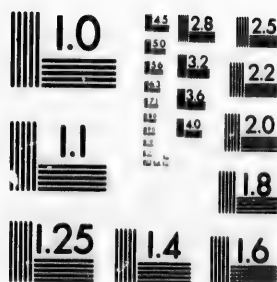


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East, and had never less than 6 fathoms. When we were so far from them as a mile to $1\frac{1}{2}$ miles, although the colour of the water was a very marked yellowish green, we had soundings of $7\frac{1}{2}$ to $8\frac{1}{2}$ fathoms. During our running survey we found the bottom very even, and the neighbourhood of the bar was always indicated by a gradual decrease of the soundings. The bottom consisted of a very fine gray sand, which offered but little resistance; hence if there is an intention to remain here for a short time, anchorage should be sought at about $1\frac{1}{2}$ miles westward of the bar, where is slimy mud mixed with black sand excellent for holding."

RIVER LEMPA.—The entrance to this river is similar in character to the others westward of it, large trees, with white trunks and bare tops rising above the lower wood, being observable on its shores. It is situated a few miles westward from port Jiquilisco and runs within a league of one of the arms of Jiquilisco estero.

The Lempa is the largest river in the state of San Salvador. Notwithstanding its great length and breadth and the immense quantity of water it contains, it is not navigable for more than 8 leagues from its entrance,—that is, with river steamers. Farther up, owing to the numerous sandbanks and rapids, navigation is almost impossible. Its bar which extends out a mile or $1\frac{1}{2}$ miles from the land is said to be impassable at the present time (1872): it should be carefully guarded against by vessels coasting in the locality. From the entrance the volcano San Salvador bears N. 50° W., that of San Vicente N. 16° W. and that of San Miguel N. 60° E. The mean velocity of the current of the river is 4 to 5 miles per hour. On the left bank are (or were) some fishermen's huts.

From the river Lempa to Libertad, a distance of about 50 miles, the coast is believed to be free from outlying sunken dangers, and it is said that there are regular soundings off it, which decrease gradually from the depth of 50 fathoms. At a mile from the land the average depth is 7 fathoms, of fine sand and mud. The land, bordered with a belt of white sand, consists of an extensive plain, from which rises in the distance the volcanoes San Vicente and San Miguel; these are of great altitude and visible from a distance of many miles.

Concordia, a port of recent creation, is at the entrance of the river Jiboa, at about 11 miles westward from the mouth of Lempa river. This anchorage serves as the port of the town of San Vicente. We have no further information respecting it.

LIBERTAD.—This port is almost an open roadstead, with scarcely any shelter. It is one of the ports of entry of San Salvador and is connected with the capital of the republic by a good cart road about 26 miles long. The village of Libertad consists merely of a few houses (or huts) attached to which is the custom-house establishment. It possesses a mole which is about 220 yards in length and has at its extremity a white building which is the first house observable when coming from seaward.

Light.—A fixed white light is exhibited from the western angle of the balcony of the custom-house, visible 6 or 7 miles. Its approximate geographical position is lat. $18^{\circ} 80' 40''$, long. $89^{\circ} 15' 30''$. The light is obscured by a building between the bearings of N. by W. and N.N.W. $\frac{1}{2}$ W.

Telegraph.—Libertad is in telegraphic communication with the capital, San Salvador, also with Acajutla and Sonsonate; the telegraph terminates at the frontier of Guatemala.

Supplies.—Very few supplies are obtainable at Libertad; meat of inferior quality, a few fowls, also live oxen are the most likely things to be had, but there is no fruit. Water is obtainable with some difficulty, from the little river Qaelama, situated at rather less than half a mile westward from the houses. The port can be considered a safe roadstead only during fine weather, or when the wind is from northward; it should not be visited from July to October.

Directions.—When bound to port Libertad, vessels from southward should sight the volcano San Salvador, and steer with it bearing N. $\frac{1}{2}$ E., as it will then lead them to the roadstead. If from eastward or westward, a better course cannot be adopted than to follow the coast at an offing of 5 or 6 miles, supposing the weather to be favourable for so doing, there being no objects immediately over the town sufficiently conspicuous to be visible from a distance.

If approaching the port directly from southward, soundings of 27 and 25 fathoms, mud, will be obtained at about 8 miles from the land, which thence decrease gradually to the beach. A nearer approach will bring into view a large white warehouse covered with tiles, having on its east side a flag-staff, and on its west side a large white house; the house is perhaps more conspicuous than the warehouse. And, when still nearer the land, the cottages thatched with palmetto leaves will rise into view.

The depth at a mile from the land is about 8 fathoms, muddy sand. Although this depth is perhaps considerable for some merchant vessels to anchor in, it is a better anchorage than nearer the shore, the bottom closer to the beach being not so good in quality, it is however a little too far out for loading and unloading cargo. Near the beach the bottom consists at first of fine sand, and afterwards of pebbles or gravel.

The rollers which set in on the beach curl and break at times in 4 or 5 fathoms, at least a quarter of a mile off. Those within, which are the most dangerous, are caused by the offset, or efflux.

The anchorage is said to be uneasy, and unsafe, and should be avoided near the full moon. Sudden rollers come in, which are apt to snap chain-cables, unless with a long range.

THE COAST.—From Libertad to Acajutla the distance is about 80 miles, along a coast believed to be free from any outlying sunken dangers and supposed to have a bank of soundings from it to the distance of 10 or 15 miles. At 1 to 2 miles from the beach the depth has been ascertained to be 18 to 16 fathoms, muddy sand. Westward of Libertad for a distance of 5 or 6 miles the shore consists of grey sand with mangroves, and is of moderate height. This sandy shore is then succeeded by land of greater elevation, which is known as the *Côte du Baume* or the *Costa del Balsamo*. It consists of a succession of rocky undulating points and perpendicular cliffs separated here and there by little bays having beaches of sand and shingle. This district produces an article known commercially as the Balsam of Peru, from its having been sent to Lima for export to Europe; it is collected solely by the aboriginal Indians who inhabit the locality. The western extreme of this part of the coast is terminated by a conspicuous rocky cape, with a well wooded summit, and having in its immediate vicinity several remarkable hillocks, covered with trees. Thence as far as point Remedios, Acajutla, the coast consists of an uninterrupted grey sandy shore, surmounted by mangroves,

behind which are seen hillocks partially covered with trees. In the vicinity of Acajutla the country is less high, more level and well clad with trees.

The volcanoes Virola, San Vicente or Sacatecoluco, and San Salvador, situated some miles inland, are a great assistance to vessels bound to ports Libertad and Acajutla, as they are visible from a distance of many miles at sea.

Virola, situated in lat. $18^{\circ} 20'$ between the volcanoes San Miguel and San Vicente, consists of high lands among which can be distinguished a mountain with many peaks as well as a cone having the appearance of an old volcano; this cannot be seen from a great distance.

San Vicente, in lat. $1^{\circ} 85'$, long. $88^{\circ} 59' 0''$ (M. Lapelin), has an elevation of about 6900 feet. It rises in the form of a truncated cone, the summit of which, viewed from eastward or westward appears cleft, one summit being more rounded than the other.

San Salvador, in lat $18^{\circ} 48' 80''$, long. $89^{\circ} 21' 21''$ (M. Lapelin), has an elevation of about 6480 feet, and can be seen when at the distance of fully 60 miles from the land. Viewed from the sea it appears behind the mountain chain in the form of a very large mountain, with a flat summit, in shape not unlike the back of a tortoise. At its extremity is a peak rather more lofty than itself.

Point Remedios is a low cliffy headland, thickly clad with mangroves and easily recognised. Rocks above and under water, over which the sea breaks violently, extend two or three miles off the point in a south-westerly direction. To avoid this danger vessels should not approach the coast hereabout nearer than 4 miles, nor within the depth of 18 fathoms. The bay eastward of the point is shallow, the depth at $1\frac{1}{2}$ miles from the shore being only 5 or 6 fathoms; as the point is rounded, coming from eastward, the soundings gradually increase.

ACAJUTLA.—From point Remedios the coast has a direction of N.N.W. for about $8\frac{1}{2}$ miles to Acajutla, the port of Sonsonate, and consists of cliffs intersected with little beaches of white sand. At the end of these cliffs is the landing place, the town itself being situated on the summit of the cliff; the town is but a small place defended by a battery, and conspicuous among the huts will be seen a tiled building occupied as a custom-house, near which is a flag-staff.

The roadstead is merely an open bay, exposed to all winds from westward; these occasionally send in a very heavy sea, hence it is not considered a desirable anchorage, especially in winter. Acajutla is one of the principal ports of San Salvador having a population of about 600 souls; its geographical position is stated to be lat. $18^{\circ} 85'$, long. $89^{\circ} 48' 80''$ (Captain W. H. Parker, P.M.S.S. Co.). At about 4 leagues from this port, in the interior, is the town of Sonsonate, situated at the foot of the volcano Isalco; this town has a population of 5000 to 6000.

A well-built mole extends out about 50 yards from the custom-house, which is situated on the summit of the cliff. Upon the greater part of this mole is constructed a shed, with a white roof; the latter affords a ready means of recognising the place at a considerable distance. The heavy seas which break upon the beach have formed a dangerous bar, which is distant more than 100 yards outside the extremity of the mole, rendering landing exceedingly difficult at times.

Light.—A fixed light, visible 7 or 8 miles, is exhibited from the extremity of the mole. It shows red to southward, green to northward and a white sector between. The direction of the best anchorage is in the sector of white light. To clear the dangers off Remedios point do not bring the light to bear to the northward of N.N.E. $\frac{1}{2}$ E.

Buoys are moored 50 yards from the mole-head, one on each side, to facilitate communication.

Directions.—When bound to port Acajutla it is recommended to get sight of the volcano Isalco, and bring it to bear N.E. by N., as that bearing leads directly to the anchorage. The mountain is situated about 12 miles from the coast, is 4972 feet high, and behind it are others of much greater altitude; it is easily recognised, although there are peaks in its neighbourhood very similar in appearance, because it is an active volcano. The column of smoke and steam constantly ascending from it and the frequent eruptions of molten lava, render it conspicuous both day and night,—it is also not of sufficient height to be so frequently hidden by clouds as are the more lofty mountains in the interior. From these circumstances it is a very useful landmark to vessels seeking the ports of San José, Acajutla and Libertad.

The usual anchorage in fine weather is abreast the extremity of the mole in 7 to 10 fathoms, sand and mud, about half a mile from the shore, with mount Isalco bearing from N. 88° E. to N. 36° E. During the rainy season, when the swell of the sea is very great and the winds from S.S.E. to S.W., occasionally very violent, it will be necessary to anchor farther out, in not less than 13 fathoms.

A good mark when running for the anchorage is the flag-staff in one with the large door of the custom-house store. If it be necessary, vessels may tack without hesitation as there are no sunken dangers, with the exception of those already mentioned around point Remedios, and the soundings are an excellent guide.

The anchorage cannot be considered convenient on account of the difficulty of loading and unloading cargo; it is however safe in fine weather. Unless circumstances compel a visit it is as well to avoid it during the months from July to October, because at that time very heavy seas are sent in by strong winds from seaward. Nor, can the holding ground be considered good, for the *Herolne* when anchored in 16 fathoms mud, dragged both her anchors although the chains were 142 fathoms long.

It is high water on the days of full and change of the moon at 2h. 35m. The rise of tide is about 9 feet. The set of the current is variable; during the fine season, however, it is generally E.S.E., at the rate of $\frac{1}{4}$ of a mile per hour.

Supplies of fresh provisions, as well as cattle, wood, sugar, &c. &c., can be obtained at Sonsonate, at reasonable prices; it is necessary, however, to give two days' notice if a large quantity of provisions is required. Coffee, sugar and indigo are cultivated in the locality. Water may be procured at the mole-head, whither it is carried by means of iron pipes.

Acajutla was visited in 1859 by H.M.S. *Havana*, Captain T. Harvey. "Starting from San José de Guatemala on May 24th, we worked down to Acajutla. Between these places a ship may stand in safely by the lead, as it shoals gradually and regularly to 10 and 12 fathoms at 8 miles from the shore. In the afternoon of the 26th we anchored at Acajutla, with point Remedios and the shoal from it sheltering us from south-

eastward. Here we found a substantially built wharf, at which there is generally a fair landing, although at times the surf is such as to prevent any approach. Merchant ships discharge and receive cargo by their own boats. On the 27th the breakers on the shore were so trifling that our cutters landed on a wooding expedition in parts of the bay without the slightest difficulty; but on the 29th the surf was so heavy that it was extremely hazardous even at the wharf, and four hours were occupied in watching opportunities to embark supplies. Beef, stock, vegetables and fruits may be obtained in any quantity from Sonsonate; but two days' notice must be given to secure any considerable amount. The pier, happily, is provided with cranes, which we had to use in getting off bullocks. We anchored in 12 fathoms with the landing place bearing N. 55° E. A vessel should not stand nearer to Remedios reef than the depth of 20 fathoms, unless with a good breeze and clear weather. The volcano Isaleco was burning during the whole of our stay,—no lighthouse gives a better light. This volcano bearing N.E. by N., is a good mark for the port."

Captain W. H. Parker, P.M.S.S. Co. (1871) gives the following instructions for Acajutla:—"In making this port from the westward you can run the coast from San José 2 or 3 miles off-shore. The low land and beach extend to Acajutla, which is on a moderately high bluff. As you draw near you will make the custom-house and wharf on your port bow, and point Remedios and reef on your starboard bow. The reef shows well out of the water and breakers extend some distance beyond the rocks.

Acajutla is on a bluff, as already observed, and from the town to point Remedios there are strips of sand-beach showing much whiter than the beach to the westward of the bluff. At the back of the town and point the land breaks in moderately high hills, which will be seen when the mountains and volcanoes are obscured. In the dry season there are so many fires on the mountains that Isaleco cannot always be distinguished. The land, though, to the eastward is high down to the sea—to the westward low, with many huts on the beach—detached and in groups.

Making the port from the southward you will see the custom-house 12 miles off, with a good glass. Keep 4 miles off point Remedios and anchor as hereafter directed. In making Acajutla from the eastward, you will open the white house on the wharf as you round point Remedios. Having cleared the reef, steer about North along the land, until you open the old custom-house clear of the bluff, and having the wharf bearing about E.N.E. run directly for it, and anchor in about 10 fathoms water.

I anchored here in 9½ fathoms, sticky bottom, and lying with 80 fathoms of chain out, with the ship's head to the southward, I took the following bearings:—Old custom-house, N.E. ½ N.; end of wharf, E. ½ S.; point Remedios, S.S.E. ¾ E.; wharf distant about three-fourths of a mile. When the ship swung with her head to the northward, I had the street leading to the wharf in view.

Keep the old custom-house open with the bluff to avoid some rocky patches."

THE COAST.—From Acajutla to Istapa the distance is about 56 miles in a W.N.W. direction. The coast consists of a beach of greyish-coloured sand, backed by a well-wooded shore, interrupted in a few places by some rivers among which are those named Grande, Caota, Santiago, Paza and Esclavos; the entrances to these are generally indicated by the white trunks of mangrove trees, but none are of importance. The

land at a few miles from the coast rises into mountains, among which will be noticed the Table of Apaneca, 5709 feet high, situated a little westward of the meridian of Acajutla, and the Morro de los Esclavos with its rounded summit, the elevation of which is estimated to be 4828 feet; between this latter and the meridian of Istapa are mountains of even greater altitude.

Agua rises in the form of a perfect cone to the height of 18,468 feet, and is apparently connected on its west side to Fuego volcano by means of a ridge of considerable altitude; the latter mountain has two peaks at its summit, of nearly equal size and appearance, one of which is always surmounted by a panoply of smoke;—the height of this volcano is estimated to be 14,000 feet. It is only in very clear weather that the lofty volcano westward of Fuego can be distinguished; it is either Atitlan or Tajumulco*; if the latter, it has a height of about 11,480 feet, and its summit forms three peaks, one of which, the middle and highest, is active. Pacayo, eastward of Agua, is 9594 feet high, and easily recognised by its jagged and irregular summit, which conveys the idea of a crater fallen in.

The surf upon all this coast is extremely heavy, especially when a strong wind has prevailed a few days from southward. It is believed that no sunken dangers exist off it, and the soundings obtained indicate great regularity in the bottom, which consists apparently of muddy sand. The depth at about half a mile from the beach is 18 fathoms, and at from 1 to 8 miles 22 to 28 fathoms; in the neighbourhood of Acajutla the bottom is not so steep. The usual direction of the current appears to be from West to East, following the coast, at the rate of a half to 1 mile per hour.

Istapa.—Istapa, formerly a port of some importance but now quite deserted, is an open roadstead, exposed to all winds from southward. The usual anchorage is at half a mile from shore, in 16 to 18 fathoms, muddy sand. In 1852 the *Brillante* anchored with the volcano Agua bearing N. 8° 21' W.; right peak of Fuego N. 15° 81' W.; volcano of Tajumulco N. 84° 58' W.; left summit of Pacayo N. 12° 48' E.; and the left summit of Esclavos N. 79° 16' E. (Variation 7° 39' E.). The depth at 4 miles from the land is 20 fathoms, mud, whence it gradually decreases to the beach.†

If mount Agua is brought to bear N. † W., Fuego N. by W. † W., or Pacayo N. by E., it will lead directly to Istapa. When on any of these lines of direction the depth at a few miles from the land is 80 to 25 fathoms, whence it diminishes gradually to the beach. A low sandy shore, covered with wood, at last comes into view; and among the trees will be seen a few grass huts, forming the village of Istapa.

The bar at Istapa is so bad during July, August and September, as frequently to prevent a landing. The bottom at the anchorage at this season is so much influenced by the heavy seas sent in by the strong on-shore winds, that much dependence cannot be placed upon the anchor holding. The coast being very steep, the bar is not far from the beach. With a northerly wind and at the period of full and change of the moon the bar is frequently impracticable.

* Tajumulco is situated in lat. 14° 36', and is about 23 miles westward from Istapa; Atitlan is in about lat. 15° 12'.

† Istapa has been closed as a port for foreign vessels since 1853, when it was superseded by San José, the present port of Guatemala.

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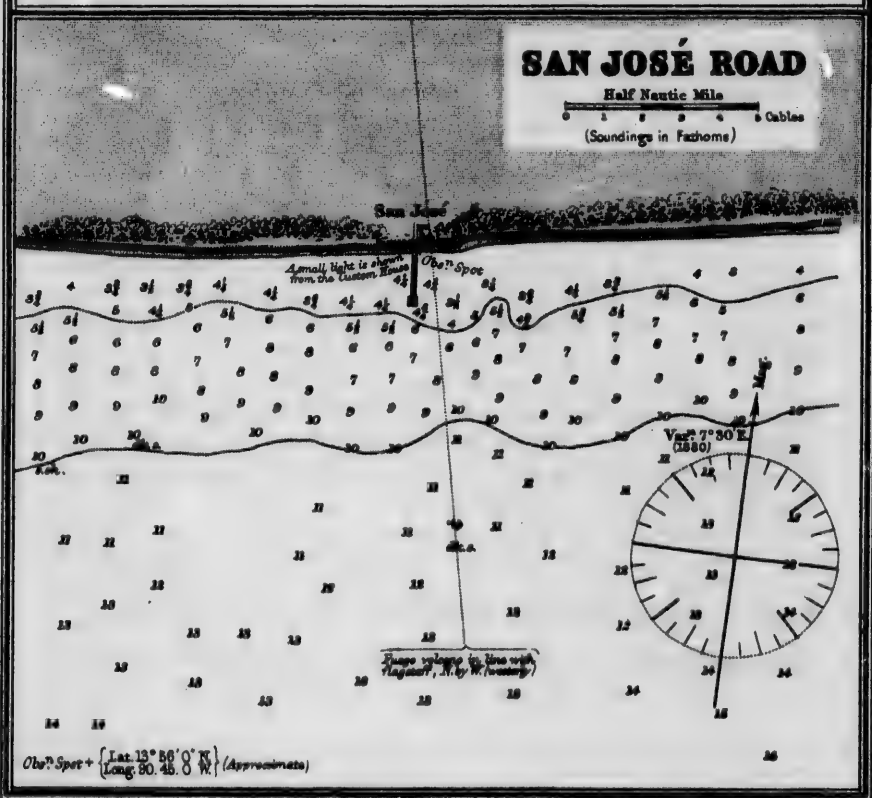
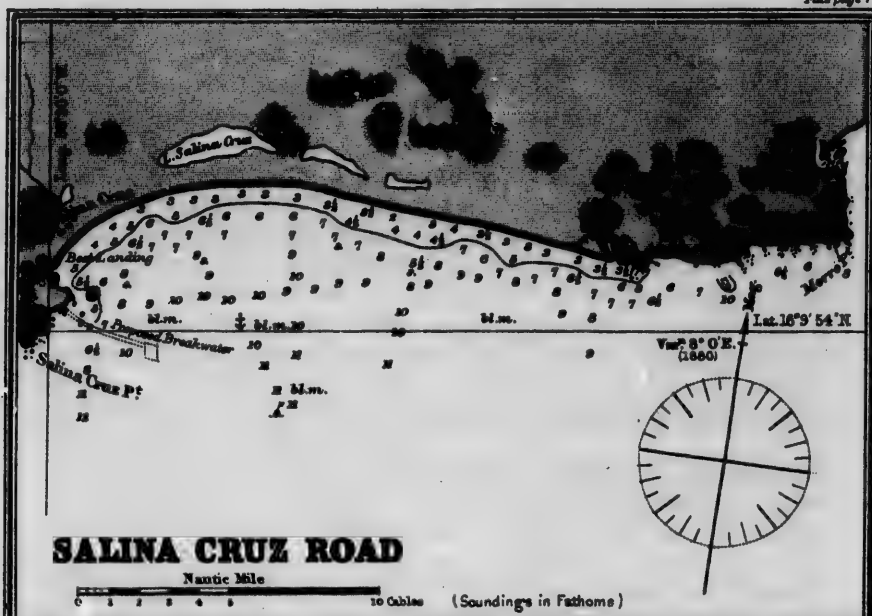
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The current follows the line of coast, flowing from West to East, at a rate of $1\frac{1}{2}$ to $1\frac{3}{4}$ miles per hour.

SAN JOSE.—From Istapa the coast trends about 8 miles in a westerly direction to San José de Guatemala or Zapote, but which is better known under the name briefly of San José. Its approximate geographical position is lat. $18^{\circ} 56'$, long. $90^{\circ} 45'$ (Nav. Officers, H.M.S. *Tenedos*, *Fantome* and *Petrel*, 1874).

San José has a population of 800 to 1000; it is a port of some importance as the only landing place for goods on the coast of Guatemala; with this exception, it has no claim to the name of a port, being merely an open roadstead. The few grass houses composing the town are built among the trees on a high dark sandy beach; a large white storehouse, which can be seen at a distance of 6 miles, forms the only mark on the coast for the port. San José is in telegraphic communication with the capital.

The anchorage is opposite the white house, in 8 to 18 fathoms sand, distant about 1 or $1\frac{1}{4}$ miles from the land. An iron pier, 380 yards in length, furnished with all the necessary appliances for loading, &c., has recently been constructed; at its extremity the depth is $5\frac{1}{2}$ fathoms. A steamer from Panama calls here once a fortnight.

A strong wind from southward sends in so heavy a sea that at times a landing cannot be effected, and at the same time disturbs the bottom so much that the anchors frequently drag; hence it can be considered a safe anchorage only during the fine season.

There is some difficulty in finding the anchorage of San José, the coast line in the neighbourhood being one unbroken line of beach and trees; the best marks, however, on coming from seaward, are the remarkable volcanic peaks of Guatemala, generally visible at dawn; four of these peaks can be seen from the anchorage on the following bearings:—Tajumulco N.W. $\frac{1}{4}$ N., El Fuego N. by W. $\frac{1}{4}$ W., La Agua North, and Pacaya N. by E. $\frac{1}{4}$ E. El Fuego and La Agua being the nearest and most conspicuous, the former may be known by a deep notch in its summit, while the latter being brought to bear North, forms the best guide till the white storehouse can be distinguished.

Light.—A *fixed white light* is exhibited from the custom-house, visible about 10 miles; it is not, however, to be depended on. At the end of the pier a small iron tower stands which was intended for a lighthouse, but no light is now shown from it. The mark for the best anchorage is the light at the custom-house eclipsed by the tower on the pier-head.

Approaching San José from *eastward* or *westward* the land for a short distance from the port may be coasted at a moderate offing, as it is believed to be free from sunken dangers, but it must be borne in mind that, as it has not been surveyed, more than usual care should be exercised; giving the shore a berth of 2 or 3 miles will be as close to the beach as a prudent shipmaster should get, and he will then have soundings of 22 to 15 fathoms,—if this distance is maintained the land breezes will be of considerable advantage. In the event of the wind prevailing from S.W. or W.S.W., it will be safe in the boards to get as close to the land as one mile, in soundings of 10 or 11 fathoms, but not nearer. The lead should be frequently hove, the soundings being an excellent guide, as they shoal gradually. If the sea wind fall without being succeeded by a strong land wind, it is recommended to anchor for the night, that the progress gained during the day may not be lost.

If the port be approached directly from *southward*, the volcano *Agua* should be brought to bear North, or that of *Fuego* N. 14° W., as either of those bearings will lead to it. When these mountains are hidden by haze, it is recommended to make the land about *Istapa*, and thence approach the roadstead until the flagstaff of the custom's establishment bears N. 20° W., when the anchor may be cast in the depth most convenient.

The usual supplies for shipping can generally be obtained at San José but only in small quantities, and at high prices. Reliance should not, however, be placed upon getting them, as the village consists of but little else than a few huts inhabited by the staff of the custom-house; even water has to be fetched from some distance in the interior.

The winds at San José, as on other parts of the coast of Central America, are, from November to May, generally from S.S.E. by South to West, from 10h. a.m. to 8h. or 9h. p.m., a short interval of calm then follows, which is succeeded by a light wind from North to N.E. From June to November a vessel should not anchor here unless at a distance from the shore sufficient to permit her to beat off with facility when the winds are from South and S.W. which often blow with very great force and raise a very high sea.

Captain W. H. Parker, P.M.S.S. Co., makes the following remarks on San José (1871):—"Approaching San José a large white house will first be observed on the port bow, after which you will make out a long wharf extending into the sea, with launches moored off it. Keep the buoy off this wharf a little on your port bow, round to off the end of the wharf, 100 yards outside of the buoy, and anchor in 9½ or 10 fathoms water and you will then be about one-third or one-half mile from the end of the wharf. Do not go to the buoy as it is rather close in.

You will find tolerable holding ground, generally mud and sand. The Commandante informed me that there is 81 feet water at the end of the wharf, and 7½ fathoms at the buoy at low water, but you should not go into less than 9½ fathoms.

At this anchorage the flagstaff on the custom-house (large white house) is in one with the end of the wharf, and will bear about N. ¼ W.

The wharf at San José is built with iron screw piles, and is, I believe, 900 feet long. All freight is put into the boats or taken from them by cranes at the end of the wharf, outside the breakers. A railway runs from the custom-house to the end of the wharf, with cars moved by hand.

There are many launches here and the Captain of the Port sends them off as soon as you anchor. San José is in lat. 18° 58', long. 90° 49'.

There is a light here on the top of the custom-house (not in the lighthouse at the end of the wharf), but it cannot be depended on. I have never yet found it lighted when making the port at night. I believe it can only be seen 5 or 6 miles at sea.

As a general rule no work is done at San José (nor at Acapulco nor Libertad) at night. Leaving Acapulco for the former place, if you find it impossible to reach there before night, it is better to slow down, and aim to reach there at daylight. In this way you economize in coal, avoid unnecessary risk, and save yourself much anxiety.

If the weather is good, however, and the night moonlight, they will sometimes work,

as the last time I was there under these circumstances, I took in 898 sacks of coffee and 110 of sugar, between 6 P.M. and 7 A.M., detention thirteen hours, working two launches.

In the rainy season it may be better to anchor a little farther out from San José, but you will be governed by the weather. A south-easter brings in a heavy sea, and sometimes communication is impossible. This whole coast is at that season subject to very violent squalls of wind and rain, attended with heavy thunder and very vivid lightning. These squalls are called *Chubascos*."

Currents.—No reliance can be placed on the set of the currents on this coast. Off San José it will sometimes run west for three days, and then east for the same length of time. I have been set in both directions at different times when running for the anchorage from the southward. I think generally the easterly set prevails.

When approaching the coast for the Gulf of Tehuantepec you will frequently be set in towards the shore, and you must be on the lookout for this, particularly in dark nights. Keep the lead going. I have been set to the eastward a knot or more an hour from the Gulf to San José.

When making this anchorage from the S.E., the only safe way is to be sure and make the land to the eastward of the port. The bearing of Agua volcano is of great assistance to you here, if it can be taken."

The coast from San José to the frontier of Mexico is very little known, hence we are not able to describe it satisfactorily. It is reported to be low, sandy and intersected by lagoons, which communicate with the sea by means of narrow passes, accessible only by boats. The mountains lying behind this flat coast are of great elevation, many of the volcanic peaks being visible at the distance of 40 miles from the shore.

San Geronimo.—This village, distant about 26 miles westward from San José, is situated at the mouth of the river Guacalate, on which are the towns of Chimaltenango and Antigua, in the interior. It consists merely of a collection of huts, with one large house, where sugar is stored ready for shipment. Its approximate geographical position is lat. $18^{\circ} 52'$, long. $91^{\circ} 16'$.

There is good anchorage off the village, in the fine season, in 6 to 8 fathoms, with Agua volcano bearing N. 17° E. Being an open roadstead it is exposed on all sides, and should be avoided in bad weather.

The port of clearance for this port and for the other small ports of this part of the coast, is San José de Guatemala.

Tecojate.—This port, situated nearly 8 miles north-west of San Geronimo, is very inferior as an anchorage to the other ports of Guatemala, because the bottom is composed of sand of a shifting nature which necessitates the anchor being raised every day. Tecojate is built on the right bank of the entrance of Coyolate river; on the opposite side stands the village of Tiquisate. The nearest town is Santa Ana Mixtam, distant about 10 miles in a north-westerly direction.

San Louis.—This place is known by two large sheds (probably storehouses for coffee) with huts on each side. It is situated at the entrance of the river Samala, and its approximate geographical position is lat. $14^{\circ} 18'$, long. $91^{\circ} 47'$ (Capt. Parker, P.M.S.S. Co.).

During the fine season, from the middle of October to the end of May, vessels can anchor here without risk; but at other times of the year the anchorage should be avoided, as dangerous. This port is connected by road with the principal towns of the province; namely—Mazatengo, Retaluleu, and Quezaltenango.

Champerico.—Champerico, 12 miles north-west from San Luis, may be known from seaward by a large white house, a white flagstaff and a number of huts. Its approximate geographical position is stated to be lat. $14^{\circ} 20'$, long. $91^{\circ} 57'$ (Captain Parker, P.M.S.S. Co.), and it is distant about 76 miles from San José. During the dry season many vessels load coffee here; during the wet season, from July to November, the anchorage is extremely bad, as the sea then breaks furiously a considerable distance from shore. The anchorage may be found by steering directly for the flagstaff until the lead indicates a depth of 6 to 8 fathoms. From this anchorage Fuego volcano will bear N. 65° E.; and Agua volcano, distant about 80 miles, N. 68° E. The merchandise exported from this port, which is increasing in importance, comes chiefly from the towns of Retaluleu and Quezaltenango, which are 20 to 80 miles inland.

The Coast.—From Champerico the coast trends north-westward and westward about 200 miles to the entrance of the great lagoons of Tehuantepec, named the Boca Barra, also known as the San Francisco bar. Of all this coast we possess little or no information, and we believe that it contains no ports that are frequented by foreign vessels. It is said to be low and sandy, and to contain many lagoons which communicate with the sea by means of narrow channels navigable only by boats. The mountains behind this low flat shore rise to a great height, and many of the volcanic peaks are sufficiently lofty to be visible when at the distance of 40 miles from the land.

The soundings off this coast are regular, and no known danger exists at a greater distance than one mile off shore. The whole coast from Tonalá bar to San José can be run at a distance of 8 miles, in about 7 or 8 fathoms water.

In lat. $14^{\circ} 48'$, long. $92^{\circ} 80'$ we are informed there is a village known as San Benito, where vessels visit in the dry season, to load hides and India rubber. In lat. $15^{\circ} 54'$, long. $98^{\circ} 89'$ is *Soconusco bluff*, at the back of which, in the interior, is a volcano about 5000 feet high, known as *Soconusco volcano*.

Tonalá Bar, in about lat. $16^{\circ} 10'$, long. $94^{\circ} 10'$, extends out a few miles seaward and it is advisable to give the shore in this locality a berth of at least 4 miles. Westward from Tonalá there are many detached huts along the shore, and there is a village, in lat. $16^{\circ} 18'$, long. $94^{\circ} 40'$, on the beach near San Francisco bar, distant about 80 miles from Tonalá bar. It is stated that in lat. $16^{\circ} 18'$, long. $94^{\circ} 87'$, about 2 miles east of San Francisco bar, is a remarkable hill or morro, marked with white strips of sand: it has high land in its rear and moderately high bluffs to the right and left, with very low land intervening. In lat. $16^{\circ} 14'$, long. $94^{\circ} 47'$ there is a village with a conspicuous church having a white cupola and backed by the beach. There is another similar village 9 miles to the westward, in lat. $16^{\circ} 15'$, long. $94^{\circ} 56'.$ *

TEHUANTEPEC LAGOONS.—These lakes extend into the land about 12 miles and have an extent east and west of nearly 40 miles. They are, we believe, useless for the

* Captain W. H. Parker, P.M.S.S. Co., 1871.

purposes of navigation and are mentioned chiefly because at a few miles westward from them are the thriving towns of Juchitan and Tehuantepec, having populations respectively of 6000 and 18,000; at the latter town are sixteen churches, and a college was established in 1850. The approximate geographical position of the entrance to the lakes, known as the Boca Barra, is lat. $16^{\circ} 18'$, long. $94^{\circ} 52'$; the latter is too shallow to admit vessels even of moderate size. On the bar breakers constantly prevail, which add greatly to the difficulty experienced in running in. Within the entrance are numerous shoals of shifting sand.

The soundings immediately outside the Boca Barra are $2\frac{1}{2}$ to 4 fathoms, fine clayey sand. The current from the lakes through this boom, in November 1850, flowed at the rate of $7\frac{1}{2}$ miles per hour.

From the Boca Barra the coast trends westward about 22 miles to the bay of Ventosa, and is throughout low and sandy, consisting for the greater part of this distance of a narrow beach separating the Tehuantepec lagoons from the sea. The soundings at $1\frac{1}{2}$ to 2 miles from it are $5\frac{1}{2}$ to 8 fathoms, on clayey sand.

VENTOSA BAY is situated in about lat. $16^{\circ} 10\frac{1}{2}'$, long. $95^{\circ} 16'$, or about 12 miles south-eastward from the town of Tehuantepec. It is not very extensive, being only 2 or 3 miles across; but it presents some advantages which the other bays on this coast do not possess. Although open to southward and eastward, vessels may safely ride at anchor in it, as the holding-ground is excellent, and the depth of 6 and 7 fathoms which prevails over almost all the bay, is very convenient. The soundings are gradual from 8 fathoms at the distance of 100 yards from the beach, to 7 and 8 fathoms at 1000 yards; and the anchorage is on a muddy bottom extending E.N.E. from Morro point, its south-west extremity. The western shore consists of low sandy land, enclosing some lagoons, which receive the waters of the river Tehuantepec. This bay has been proposed as the Pacific termination of a railway across the isthmus of Tehuantepec from the Gulf of Mexico, the construction of which is reported to present no difficulties of greater magnitude than an engineer of ordinary ability would be able to overcome.

Point Ventosa, the western extreme of the bay, is a high sandy point; it is easily recognised as it is the last of the high land when coming from northward. Eastward of Ventosa the land is very low. On Ventosa point (known also as the Morro) is a tolerably high stone tower, roofed in and with windows near the top; near it is a flag-staff. This tower cannot be seen to the westward of North; consequently to vessels going eastward it comes into view as they pass the point. It should also be borne in mind that to the westward of the point the water is very deep, while to the eastward there are regular soundings.

Mr. Temple says "I am of opinion that Ventosa bay is not only the best, but the point for a harbour on the Pacific coast of the isthmus. It is a far better and safer port than either Valparaiso or Monterey; ports in constant use the year throughout. I speak from personal observation, as well as from an examination of the several charts, and the similarity of outline has suggested the comparison; for, although the indentation of the coast is possibly a little deeper at each of these places than at Ventosa, yet they are both open to northward, and as the general trend of the coast is

nearly north and south, the prevailing gales blow directly along shore and into these harbours, creating a heavy swell, and often forcing vessels to slip and go to sea for safety: whereas, at Ventosa the trend of the coast is east and west, so that the "northers" blow directly off-shore, and create no swell whatever. The danger being from the sudden strain brought upon a cable by the surging of a vessel in a sea-way, and not from the steady strain caused by the wind, it follows that "northers" may be disregarded in an estimate of the safety of this anchorage, as was satisfactorily shown in the case of the *Gold Hunter*. But "northers", although frequent during the winter, and seldom occurring at other seasons, are the only gales that blow in this region. The southerly winds, characteristic of the summer and autumn, are said to be nothing more than thunder squalls of short duration, and incapable of raising a sea. Even the fresh and steady sea-breezes that prevailed during the latter portion of our stay at Ventosa bay were unaccompanied by any increase of swell."

The following is an extract from the report on Ventosa bay by the engineer, P. E. Trastour, Esq. :—

"The western extremity of the bay is formed by the Cerro Morro, an isolated rock of oblong shape, rounded at the summit, about 150 feet high and 2600 feet in circumference; and a little more to the south by a pointed rock, separated from the former by an interval filled in with sand, and forming an angular projection into the sea, known under the name of the point of the Morro.

On the west, the point of the Morro is contiguous, by its base, to an uninterrupted series of rocky hills, lining the beach and covering an extent of 6000 feet. They cut perpendicularly the flank and rear of an agglomeration of moderate heights, somewhat rugged and precipitous at their summits, and forming together a thick cluster of granitoid structure disposed in strata wherein feldspar and amphibole are predominant. It is the last link of that chain which, detaching itself at the north-west from the cordillera of Oaxaca, descends by an irregular series of decreasing heights, passes to the north of Huamelula, turning it at the south-east, and terminates at the Pacific ocean, where it separates the bay of Ventosa from the bay of Salina Cruz.

The sandy strand of Ventosa commences at the foot of the lateral portion of the Cerro Morro, facing the east, and describes from the south to the north-east an arc nearly $2\frac{1}{2}$ miles in length; then takes an easterly and almost rectilinear direction, but drawing a little towards the south, extends on about 6 miles farther, where it runs into the sea; after which it turns back again abruptly and inclines towards the north, though trending all the while in an easterly direction.

From the summit of the Cerro Morro looking towards the east, the beach loses itself in a distant horizon, and unfolds to the eye a long belt of white sand from 200 to 800 feet wide, terminating inland by a vast plain, scarcely broken upon by the isolated hillocks of Huazontlan. This plain, of a slightly undulating nature, is composed of sand, clay, and vegetable earth. It is covered with trees of moderate size, which grow both thinner and smaller, as one advances towards the east. But in the direction of the cordillera which separates the isthmus into two parts, north and south, this alluvial country is generally flat, presenting at rare intervals detached heights, easily avoided in the planning of a road of any character whatever, offering to the view fields of corn,

indigo, sugar-cane, palm-trees, nopals, bananas, orange-trees, cocoanut-trees, and plants of which the vigour and variety bear witness to the great fertility of the soil.

The sandy beach of Ventosa itself is cut by lagoons of little depth, having several outlets into the sea, and by the bed of the Tehuantepec river. At the time of the periodical overflow, this current flows over a low country before reaching the Pacific ocean, in which it then empties itself, not only by its mouth, but also by means of those lagoons, its sole outlets during the dry season.

The volume of the water of the river is subject to very great variations in the course of the year. In the rainy season it reaches 12 feet depth, in years of an extraordinary character.

The rainy season usually commences in the month of June and finishes in the beginning of October. The isthmus, in general, offers as many different climates as localities, differing from one another by their situation, the nature of their soil, the atmospheric phenomena, and the position of their mountains in respect to the cardinal points.

Advantages.—The immense basin of Ventosa presents a safe and commodious harbour to vessels of all sizes. Closed at the west by the heights of the Morro, it is open at the south and east. This configuration of the bay allows vessels to have ingress and egress, irrespective of the quarter from which the wind blows. Throughout its great extent, and on entering it from the sea, no shoals are to be met with; everywhere a good anchorage is to be found. The bottom is of compact sand, and a great proportion of it is mixed with clay.

The depth is almost regularly graduated; it presents at from 350 to 8000 feet distance from the shore, a progressive running from 17 to 58 feet, and averaging, for the first 1000 feet, 2 feet increase per 100 feet, and about 6 inches per 100 feet for the following 1000 feet.

The greatest difference that has been observed in the level of the water was $8\frac{1}{2}$ feet.

Winds.—Besides the variable winds, which are rather light, and the land and sea breezes of the morning and evening, the prevalent winds, the N.N.E. and S.S.W. winds, reign during a great portion of the year on the southern coast of the isthmus. The first of these two atmospheric currents is not felt at 60 miles east of Ventosa, beyond the Barra de Tonala; nor at 62 miles west, beyond the mountain of Chahube, which bounds on the west the lagoon of Tenglunda.

The N.N.E. wind usually begins to blow about the 15th of October and ceases in the fore part of April. In the month of November it blows without interruption, and at that time it reaches its maximum. Towards the middle of December it ceases during intervals of from 10 to 12 days, and then begins anew to blow one or two weeks. These alterations or interruptions and renewals are reproduced at short and unequal periods. But the length of the period of discontinuance goes on gradually increasing till the wind only blows one day, and finally ceases completely.

The Indians of Santa Maria del Mar are familiar with the indications announcing the coming of the N.N.E. winds. In the evening at about sun-down, if the summits of the mountains of Guichicovi and San Miguel Chimalapa (seen from the coast) are concealed from the view by quantities of slate-coloured vapour, it is indicative that the

"northerns" will blow the day following, and will last as many days as the summits of those cordilleras continue to be covered with similar clouds. Vapour of a corresponding hue, seen at the same hour, at the horizon of the Pacific ocean, announces that the S.S.W. wind will blow on the day following.

The S.S.W. wind, which in winter succeeds the North wind, during one or two days at most, is the only general wind prevailing during the months of June, July, and August. After some gales of more or less intensity, which may be compared to the violence of the North wind, and not exceeding $1\frac{1}{2}$ to 2 hours' duration, the southerly wind is definitely fixed. Towards evening its intensity decreases till the next morning, when the same phenomenon is renewed. Still, this wind is subject to more interruption than the North wind, and the intervals of repose last longer. The S.S.W. wind, passing over the ocean, reaches the coast of the isthmus laden with vapours, which at certain hours of the day resolve themselves into abundant showers.

In winter and in summer, during the prevalence of the southerly and northerly winds, the current of the sea is from east to west; its greatest velocity is about $1\frac{1}{2}$ miles per hour. This continual movement in the waters of the Pacific is only discernible at a distance of about 6000 feet from the shores of Ventosa.

The bay of Ventosa is much safer than the harbour of Vera Cruz. Violent tempests frequently render the latter inaccessible during several days, and even when the North wind blows, the communication between the town and the vessels in the harbour is interrupted. During our sojourn at the isthmus of Tehuantepec, we never had to record one tempest or hurricane on the Pacific ocean.

In December 1850, while we were at Ventosa, the N.N.E. wind blow (off shore) with extreme violence from the 7th to the 17th of that month, and we remarked, with surprise, that the sea was not agitated.

To enable one to appreciate the condition of the sea at Ventosa, such as it actually is, it would perhaps be well here to mention that our soundings were effected by means of an open boat, 5 feet beam by 18 feet long, which we had brought from New Orleans, and which was conveyed across the cordillera; with this boat we were able to sail out 8 miles into the open sea."

SALINA CRUZ.—This bay lies to the westward of Ventosa point; from this point the sandy beach of Salina Cruz trends westerly for about 2 miles and bending to the southward terminates at Salina Cruz point, a rocky projection, off which are several clusters of rocks, above and under water, to the extent of a cable; outside these rocks the water is deep, the soundings being 8 and 9 fathoms. In the bay the depth increases from 4 fathoms near the shore to 8 and 10 fathoms at 3 cables from the sandy beach. The village lies on the western corner of the bay, and on the side of a hill to the right of the huts are the ruins of a large building of a reddish colour. At a quarter of a mile north of the point, at the foot of the high ground, is a spring. The anchorage is said to be superior to that of Ventosa and equally well sheltered from northerly winds.

The geographical position of Salina Cruz point, according to the U.S. survey of 1871, is lat. $16^{\circ} 9' 54''$, long. $95^{\circ} 20'$.

It is intended to construct a breakwater which will extend out from the east side of Salina Cruz point about 4 cables in an easterly direction.

Salina del Marques lies to the westward of Salina Cruz and is similarly formed, about $2\frac{1}{2}$ miles in extent, with lagoons at the back of the strand.

The town of Tehuantepec lies to the northward of the bays just described and is distant about 11 or 12 miles from port Ventosa in a north-westerly direction.

Morro Ayuca.—From Salina Cruz the coast trends in a W.S.W.-ly direction, about 40 miles to the Morro Ayuca, and is but little known. This is the southern point of an open bay, the extent of which is about $1\frac{1}{2}$ miles, and whose shore is low and sandy. Here vessels may anchor in 6 or 7 fathoms, fine sand, at three-quarters of a mile from the land, but only when the wind is from northward, for a strong wind from southward or south-eastward sends in so heavy a sea as greatly to endanger the vessel being driven on shore. A reef, with a depth of 3 and 4 fathoms almost close to it, surrounds the Morro for a short distance, and extends from its northern side about $1\frac{1}{2}$ cables; some of the rocks are, we believe, always visible. The Morro is a bold cliffy point, and its position, according to Sir E. Belcher, R.N., is lat. $15^{\circ} 51' 56''$, long. $95^{\circ} 48' 56''$.

GUATULCO.—From the Morro Ayuca the coast continues to trend in a similar direction as that just mentioned, about 25 miles to the little harbour of Guatulco, which according to Sir E. Belcher, R.N., is in lat. $15^{\circ} 44' 24''$, long. $96^{\circ} 8'$. It is formed by a rocky point which encloses on its west side a bay having a width not exceeding a third of a mile, and which extends nearly half a mile to the north-westward. The soundings are 9 to 4 fathoms, gradually decreasing to the beach at its head; a flat of $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms water extends from its north-eastern side nearly a cable, so that the deepest water is in the middle or over to the south side of the bay. A reef, having some rocks upon it above water, extends out in an easterly direction from the rocky point about $1\frac{1}{2}$ cables; and, outside this a short distance, but separated from it by a narrow channel of 10 fathoms, are some rocky islets, having sunken rocks about them.

Port Guatulco affords shelter from all winds except those from south-eastward, which blow directly in; hence it is a convenient anchorage in the summer months.

Mr. Masters says of Guatulco and the coast eastward of it*:—"On entering the gulf of Tehuantepec, near the shore, we found the current setting to the W.S.W. $1\frac{1}{2}$ miles per hour. As the wind was easterly and light, we made a stretch to the southward, and in lat. 15° , long. $95^{\circ} 30'$, I had a boat lowered and tried the current, and found it setting S.S.E., 1 mile per hour; there had been a fresh breeze from the eastward the day previously. The following afternoon we were close in-shore, and found, as we approached the land, that the current had gradually altered, and was setting to the W.S.W. We came to an anchor the same evening in the bay of Bamba, which is to the south-west of Morro de Zipagua, the current setting to the W.S.W. nearly 2 miles per hour. After a fresh S.W. or southerly sea breeze, the current close in-shore has run to the S.E., but this is not general, and does not last a long time.

* *Nautical Magazine* 1889.—The positions of Mr. Masters are about 7 miles northward and 9 miles westward of those by Sir E. Belcher. The whole of this coast is very imperfectly known, and many of the places mentioned by Mr. Masters cannot be recognised on existing charts.

Whilst we were getting to the eastward in the gulf of Tehuantepec, we experienced a slight "norther"; as we stretched off-shore it hauled into the N.E.; a disagreeable short sea arose, the wind blowing in gusts, and the weather hazy.

Santa Cruz, port of Guatulco, in lat. $15^{\circ} 51'$, long. $96^{\circ} 17'$, is very difficult to make. It is situated in a small bay, about half a mile wide at its entrance, and runs in northward upwards of $1\frac{1}{4}$ miles. At the bottom of the bay is a sandy beach, and on its eastern side are two huts which cannot be seen unless close in-shore. At three-quarters of a mile E.S.E. from the eastern point of the bay is the Piedra Blanca, a reef of rocks extending east and west about a quarter of a mile. The western part of the reef is about 40 feet high, and for about one-third of its length it is of the same elevation, but the remaining two-thirds to the eastward is low, and in places level with the water. When abreast it, and off shore a few miles, it appears to be a part of the coast. Although it is called Piedra Blanca, it is a dark irregularly-shaped reef of rocks.

The anchorage in Santa Cruz is said to be good. It is well sheltered from all winds except between East and S.E. by S.; but, as the strongest winds blow from northward, except in the rainy season, it may be considered a very safe port. It is the only place that can be considered a harbour, eastward of Acapulco; and even in the rainy season, I was informed, a vessel might lie there in perfect security. The depth of water in the bay is from 7 to 9 fathoms, with a clear bottom.

About 8 miles E.N.E. from Santa Cruz, is the island Tangolatangola, which is separated from the main by a channel a quarter of a mile wide. This makes from the westward as a part of the main land; the outer part of it is quite bluff, or rather a cliff of a brownish stone, the strata of which are horizontal, and have the same geological appearance as the land on the main nearest it towards the N.E., and of the same height, namely, about 150 feet. Within the island and round the western side, is the entrance of the bay of Tangolatangola; it runs in about N.E., 2 miles. At the bottom of the bay is a fine sandy beach. The anchorage is said to be very good in it, but not equal to Santa Cruz. Its entrance is nearly a mile across, and continues nearly the same to the bottom.

Westward, half a mile from the head which forms the western part of the bay or harbour of Santa Cruz, is a bluff point or head, under which is a good leading-mark for knowing the harbour. There is a cave in one of the rocks, level with the water, and close in-shore, and every swell that heaves in throws a quantity of water into it, and as the cave has a small aperture in the upper part of it, the water flies up resembling the spout of a large whale. It has often been taken for one by strangers, and deceived us by its appearance. In the night time, or foggy weather, when it is calm, or blowing a light breeze, the sound can be heard at some distance, like a whale blowing. This place is called the Bufadero.

When about 5 miles off the shore from the Bufadero, the western extreme point of land has a broken rocky appearance, and is not so high as the land adjoining. When about 2 leagues off-shore from the Bufadero, another cape, farther westward, can be seen. Its extreme point is rather low, but rises gradually inland to a moderate elevation.

Westward of Santa Cruz are two bluff heads, which, when abreast of, might be taken for islands. The first is about 3 miles from the port; the other is 2 miles further westward, and has a white sandy beach on its western side. On the eastern side of the eastern head there is also a small sandy beach, from which to the Bufadero the coast is rocky. The land which crowns this part of the coast is covered with stunted trees and brushwood. About 4 or 5 leagues N. $8^{\circ} 30'$ W. is the Cerro Zadan, having a bell-shaped top, and a ridge on the north-east side connecting it with the higher range of the cordilleras. The Cerro Zadan is elevated above the sea rather more than 6000 feet. The mountains farther inland, a few leagues, cannot be much short of 10,000 feet high, as they can be seen over the Cerro Zadan.

The port of Guatulco is so bad to make, that vessels have been upwards of a fortnight in searching for it; and it was by the greatest chance possible that we had not passed it, although we were not $1\frac{1}{2}$ miles from the shore. The two huts, which were on the beach, can scarcely be distinguished from the trees near which they are built.

From Morro de Ystapa the coast runs about E.N.E. to Punta de Zipegua, in lat. $16^{\circ} 1'$, long. $95^{\circ} 28' 80''$. Between these points are several bluff headlands, which do not project far out from the general line of the coast, and afford no shelter. Punta de Zipegua forms the eastern part of what is called the bay of Bamba, and is a very remarkable headland. From the westward it shows itself with a bold dark cliff to the sea, about 400 feet high. It projects out from the western line of coast nearly a mile, making like a double head. A short distance within the outer bluff is a peaked hill, with the appearance of a light-coloured sandstone, and quite bare of vegetation. Farther inland, between 1 and 2 miles, the ground rises higher, in small hummocks, a few of which are quite bare, and others have a small quantity of stunted trees and bushes scattered over them.

The head, forming the western side of the bay of Bamba, is not so high, nor does it rise so suddenly from the sea as Punta de Zipegua. It is also covered with bushes. The eastern side of Punta de Zipegua is covered with bushes and trees, the sand only showing through the soil in a very few places. When abreast of it, and off the shore from 2 to 3 miles, the current was running to windward W.S.W., from $2\frac{1}{2}$ to 3 miles an hour. About N.E. from Punta de Zipegua, 4 or 5 miles, is a high reef of rocks called Piedra de Zipegua, or Machaguista, in the chart island of Eschevan. Its greatest elevation is from 60 to 70 feet; and its length is about a third of a mile in an E.S.E. and W.N.W. direction. It is said that there are no dangers near it but what can be seen. Between it and the main, from which it is about 4 miles distant, in a N.W. direction, is good anchorage; the best anchorage is close to the reef. The pearl oysters are plentiful near this reef; they are caught by the divers in the rainy season. The general line of coast, from Punta de Zipegua towards Tehuantepec, runs about N.E. by N. easterly.

As I had now passed northward and eastward of the position where, by my instructions, I was led to believe our cargo was, we hauled to the wind, with a fresh breeze from the southward, and made a tack or two to fetch the bay of Bamba. At 4h. P.M. we came to anchor abreast the western part of the beach, in 9 fathoms, sandy bottom, off-shore $1\frac{1}{2}$ miles. As soon as we anchored, I went on shore to ascertain where the

wood was cut for our cargo, and, with difficulty, got to speak with an Indian, who was greatly alarmed at seeing such a large canoe (as he called the brig), and thought we were come to plunder the coast.

Shortly after landing, the proprietor came down on horseback, and stated that he believed there was some brazil wood at a place called Rosario, (in my instructions it was called St. Francis de Guatulco), and that Rosario was several leagues nearer Guatulco. He said that ours was the only vessel larger than a canoe, that had been on this part of the coast for a great number of years. No vessel had ever loaded hereabouts. The beach, or Playa de Bamba, is about 5 miles long, and must be very bad to land on, with a fresh sea breeze. There was more surf on it when we landed than was quite agreeable; and the boat was half-filled, although the wind was blowing along the coast. We remained at anchor until the morning, and got under way with the land breeze, keeping at about half a mile from the shore, excepting when abreast of the headlands. In the evening we came again to an anchor, in 9 fathoms, sandy bottom, opposite a small sandy beach, $1\frac{1}{2}$ miles from the shore; having seen nothing during the day like wood piled up, or anything in the shape of a signal. In the morning we again got under way, and stood to the westward; and at 10h. A.M. were off the port of Guatulco. I sent the boat on shore to enquire for the place where our cargo was lying; an Indian got into the boat, from whom I learned that we had passed it, and, as he knew the place, I kept him on board, and made all sail, with the wind S.W., for the place, and at 6h. P.M. came to an anchor in the bay of Rosario.

The town of Guatulco is 8 leagues from the port, and this is the only port in the state of Oajaca, where goods can be imported. Its commerce can be easily imagined when the person who is *administrator* of the customs, is also captain of the port, &c.; indeed he is the only individual, both in the marine and custom-house departments, with the exception of an old man, who lives at the port, and sends him information when there is any arrival. Mexican vessels can load on the coast by having an order from any custom-house in the Republic where they may have touched at; but foreign vessels are compelled to touch at Santa Cruz to pass the custom-house visit.

From the island Tangolatangola to the bay of Rosario there are several small headlands, which do not project much beyond the general line of coast, with the exception of Morro de las Salinas de Rosario. Most of them have a steep cliff facing the sea, with fine sandy beaches between them, at the back of which are scattered a few small trees and bushes; the land rising in very irregular-shaped hills towards the cordilleras. Abreast of the beaches, between the heads, I found the anchorage quite clear; and when in 9 to 12 fathoms water, the distance off-shore is about a mile, with sandy bottom.

The west side of the bay of Rosario is formed by the Morro de las Salinas de Rosario, and is in lat. $15^{\circ} 50' 25''$, long. $96^{\circ} 2'$. It projects about a mile beyond the line of coast. On its western side is a beach 4 or 5 miles in length to the next head. When abreast of Morro de las Salinas, it appears like an island with two large rocks abreast its eastern and western part, but the whole is connected with the main. What appears to be the eastern rock, is a broken rocky head, about 160 feet high. The western is about half that elevation. Both these heads terminate with a broken cliff;

the tops of them are bare and of a greyish colour, but the lower part is quite black, caused by the sea breaking against them. Between these heads is a small sandy bay, at the foot of the Morro, which rises gradually from the beach to the top of the hill; this is about 180 to 200 feet high, and presents a very barren appearance, having but a few straggling bushes on it. The beach of Rosario is 10 miles long, from Morro de las Salinas to Morro de la Laguna Grande which is its eastern extremity. At about half the distance between the Morros, is a rock on the beach, about 40 feet high, and nearly the same diameter at spring tides. The water flows round it.

During the time of our lying in the bay of Rosario, which was from the 12th of February to the 1st of April, we had three smart "northers," which came on at full and change of the moon. At this time the surf runs very heavy on the beach. Our boat was capsized several times while we lay here, in landing and coming off. At times the sea broke very heavily in all parts of the bay, that is, on the beach. I was caught on shore, a few days after arriving here, during the first "norther," which came on suddenly, with a parching hot wind. A cross confused sea hove in from the south and north-east. The wind must have blown strongly out in the gulf, from the same direction; and, though it blew heavily for three days, with the wind at times to the westward of North, the sea kept up until some time after the "norther" had ceased blowing. This is not generally the case, for a strong "norther" (and particularly if it veers round to N.N.W.) beats the sea down; at which time the landing is attended with little or no risk, which was the case when we had the last two "northers". I was informed (and, judging from appearances, I think correctly,) that very often when the wind is North or N.N.W., close in-shore, it is N.E. in the offing, which makes it impossible to land on the coast. I remarked whilst lying here, at the full and change of the moon, and when no "norther" was blowing, that, although the surf ran so high that no boat could land, the vessel lay without any motion. We were moored at less than 800 fathoms from the shore. The surf appeared not to be caused by a swell rolling in and agitating the sea at the surface, but to rise from below, and without any apparent cause, as we had light winds and fine weather the most of the time we lay here. On another occasion, I was caught on shore with a boat's crew for three days. In attempting to get off to the ship, the boat was capsized and stove. It was then, and had been for a week previous, nearly a calm. The heavy ground-swell invariably hove in from the S.S.W. We fortunately escaped from this beach without losing any of our people, which was more than I expected, having had three laid up at different times, who were saved from being drowned by a mere chance.

In addition to what has been said about this part of the coast, it can be known by the low land at the back of the beach of Rosario, which runs in from 1 to 2½ leagues before there is much rise in it, and is thickly covered with trees. From North to N.W. of Morro de las Salinas, nearly 2 leagues from shore, the rising ground is formed by a number of small barren hillocks. From our anchorage, at the place where we loaded, the following bearings were taken, lying in 9½ fathoms, sandy bottom. There are two large patches of a whitish appearance, the farthest range of the cordilleras; the eastern is the lowest, and bore N. 59½° W. The appearance cannot be seen, unless from a little to westward of Morro de las Salinas. This has every appearance of being a

waterfall, and rises from the other patch in a N.W. direction, at about an angle of 45° . It issues from a small valley in the Cerro del Chonga. The highest point of this range has but a small elevation above it, and is covered with trees. The waterfall inclines towards the south, and can be seen for several hundred feet descending, before it is lost sight of amidst the forest below. Cerro de Zadan bore N. 89° W.; the extreme bluff of Morro de las Salinas, S. 86° W., $8\frac{1}{2}$ miles; the eastern point well within the bearings, and Punta de la Laguna Grande, N. 71° E., 6 to 7 miles; the rock on the beach, mentioned as being 40 feet high, N. 65° E.; and the galena or shed, under which the cargo was piled, N. 26° W., half a mile.

At the western part of the bay are four palm trees, close to the beach. The distance from the Morro de las Salinas is about half a mile, and between these trees and the Morro is a large cluster of palms. Between these two clusters is, at all times, the best place to land, as a boat can beach here with comparative safety, when, at every other part of the bay the sea runs very heavy. At the neaps we found the place quite smooth, with the exception of a sea heaving in about every 10 or 15 minutes; but it causes no risk to a boat, provided she is kept end on.

At the south-western part of the beach, and where a small pathway leads to cross the Morro de las Salinas, close to the sea side, in the cliff of a rock is a small spring of excellent water. We always found it clear and cool, even at noon; my consignee said we could fill the ship's stock of water from it with dispatch, but I soon found out that he knew nothing about it. The quantity that could be filled in a day did not exceed 80 gallons; and, after having landed all our water-casks, we had to re-ship them, through a great deal of surf, and land them at the galena, abreast of the ship. We filled our water at a well about a mile from the beach, but the supply was very limited, it being the only well that had water in it up to the day of our sailing. We did not complete our stock.

Near the Morro de la Laguna is a large lake, from which the headland takes its name. A few miles farther eastward is the Morro de Santiago de Ystapa (in the chart it is called Morro de Ayuta), near which is the entrance of the small river Ayuta, the stream that runs by Huamilulu and Ystapa. There is a bar across the entrance. The canoes land on the beach in preference to going over it, as it is attended with danger."

The following remarks are by Captain Parker, P.M.S.S. Co., 1871:—"Port Guatulco, in lat. $15^{\circ} 45'$, long. $96^{\circ} 4'$, is recognized by the *Bufadero*. All this coast, from Washington bluff to port Sacrificios can be approached within two miles.

The current in the dry season (winter) is generally to the S.E. and East along the land; during the summer months (May to November) with southerly weather it is supposed to run to the N.W. and west. As you are constantly in the influence of the tides you will find it very variable at all seasons.

You will now enter the gulf of Tehuantepec, and if in the summer or rainy season, a course should be shaped for the coast of Guatemala if bound for San José; or for cape Blanco, if to Panama *via* Punta Arenas.

If bound to Panama direct from Tartar shoal, shape a course about E. by S. $\frac{1}{2}$ S. for Montuosa island; in the months of May, June, July, August and September by doing so you avoid the heavy rains and squalls found closer in-shore.

You will find it necessary to keep more to the southward, say E.S.E. after the first day, as from that time until passing cape Blanco a strong N.W. or W.N.W. current will be experienced.

In the winter season (from October to April) it is advisable to haul up round port Sacrificios towards the head of the gulf of Tehuantepec; the object being to keep under the lee of the land, in smooth water, in case it blows from the northward.

I would here remark that, a gray mist hanging over the mountains and a red sunset,—the red extending toward the zenith,—are sure indications of a norther; and if on entering the gulf, either from the eastward or westward, you meet with a north-westerly swell, a norther will surely follow. Sometimes double-headed clouds are seen to the northward, with clouds or mist hanging over the tops of the mountains; at others it will blow a fresh gale without a cloud in the sky. The barometer does not indicate them, nor does the temperature of the water. These winds commence from the N.E. or N.N.E., veer round to the northward, and as you advance into the gulf veer to the N.W., and finally die out at West as you approach the coast of Guatemala.

From Sacrificios to Ventosa you can follow the land at a distance of a mile. The whole coast between these points is put on the chart about four miles *too far to the westward*.

Estrete island lies in lat. $15^{\circ} 58'$, long. $95^{\circ} 29'$; it is a large white rock. In about lat. $15^{\circ} 59'$, long. $95^{\circ} 20'$, is a remarkable sand down, a high bluff, visible a long way. It is about 16 miles from point Ventosa, and the first after passing Sacrificios, though there are one or two between it and Salina Cruz. About half a mile off the first bluff to the N.E. of Estrete island, and between it and "the sand down there is a rock awash, the only known outlying danger."

Sacrificios is a little port situated about 10 miles south-westward from Guatulco. In front of it is an islet, about a quarter of a mile in extent, which shelters the bay from easterly winds; this islet is surrounded by rocks, and the shore of the bay is also lined with rocks to a considerable distance. The depth of the anchorage is about 4 fathoms on sand. The approximate geographical position of the bay, according to Capt. Parker, P.M.S.S. Co., 1871, is lat. $15^{\circ} 48'$, long. $96^{\circ} 12'$.

It is high water on the days of full and change of the moon at 8h. 15m. p.m.; the rise of tide is about 6 feet.

A rock, on which the U.S.S. *Tuscarora* touched three times when attempting to get an anchorage off the entrance of Sacrificios bay, is stated to be about $1\frac{1}{2}$ cables S.S.E. $\frac{1}{2}$ E. from the south-west point of Sacrificios island. The rock has 11 feet water on it at low tide.

Port Sacrificios is difficult to recognise. It is recommended therefore always to take your departure from White rock, an excellent mark, lying a mile off shore about $16\frac{1}{2}$ miles to the westward of the port. White rock, according to Capt. Parker, P.M.S.S. Co., is in lat. $15^{\circ} 40'$, long. $96^{\circ} 30'$.

Port Angeles is a small harbour suitable only for schooners, &c., lying about 15 miles westward of port Sacrificios and $1\frac{1}{2}$ miles eastward of the White rock mentioned in the previous paragraph. It is a port of entry for the city of Oajaca, and has been open to foreign commerce since February 1868. The landing here is said to be bad,

behind some rocks, and the surf is very violent. We have no instructions of recent date relating to it.

The COAST westward of port Angeles, as far as Acapulco, a distance of about 200 miles, is very imperfectly known; it should, therefore, have a wide berth given to it.

It is stated that in lat. $15^{\circ} 50'$, long. $97^{\circ} 8'$ there is a high bluff with huts on it among the trees, and 3 or 4 miles eastward of this, a river, probably the Rio Sicaleta, 5 miles eastward of which is another river, the Rio Colotepec. In lat. $15^{\circ} 55'$, long. $97^{\circ} 21'$ are two white rocks, known as the Alcatrazes; to the westward of these are a few huts. About 11 miles westward of the Alcatrazes is a large high bluff, 5 miles wide, known as Morro Hermoso, the geographical position of which is stated to be lat. $15^{\circ} 58'$, long. $97^{\circ} 32'$; 7 miles farther westward a smaller bluff (Little Morro) will be observed, close to the eastward of which is a reef and at the back of it a large lagoon. In lat. $15^{\circ} 59'$, long. $97^{\circ} 48'$ is a river known as the Rio Verde; in rainy weather the water in the neighbourhood of this river is frequently much discoloured. There are a few huts midway between the Little Morro and the Rio Verde.*

Maldonado Point and adjacent Shoals.—Maldonado or Escondido point, the western extremity (El Recodo) of which is in lat. $16^{\circ} 18' 40''$, long. $98^{\circ} 32'$ (U.S. Government Survey, 1878) is a tolerably well defined point, but cannot be recognised from the westward except when close in-shore, and when coming from eastward it disappears after passing the bearing of N.N.W. The shore trends from the point S.E. by E. $\frac{1}{2}$ E. on one side and N.W. on the other. Close under and westward of the point is a small bight in which is a good boat landing, one mile from which fresh-water is found in abundance.

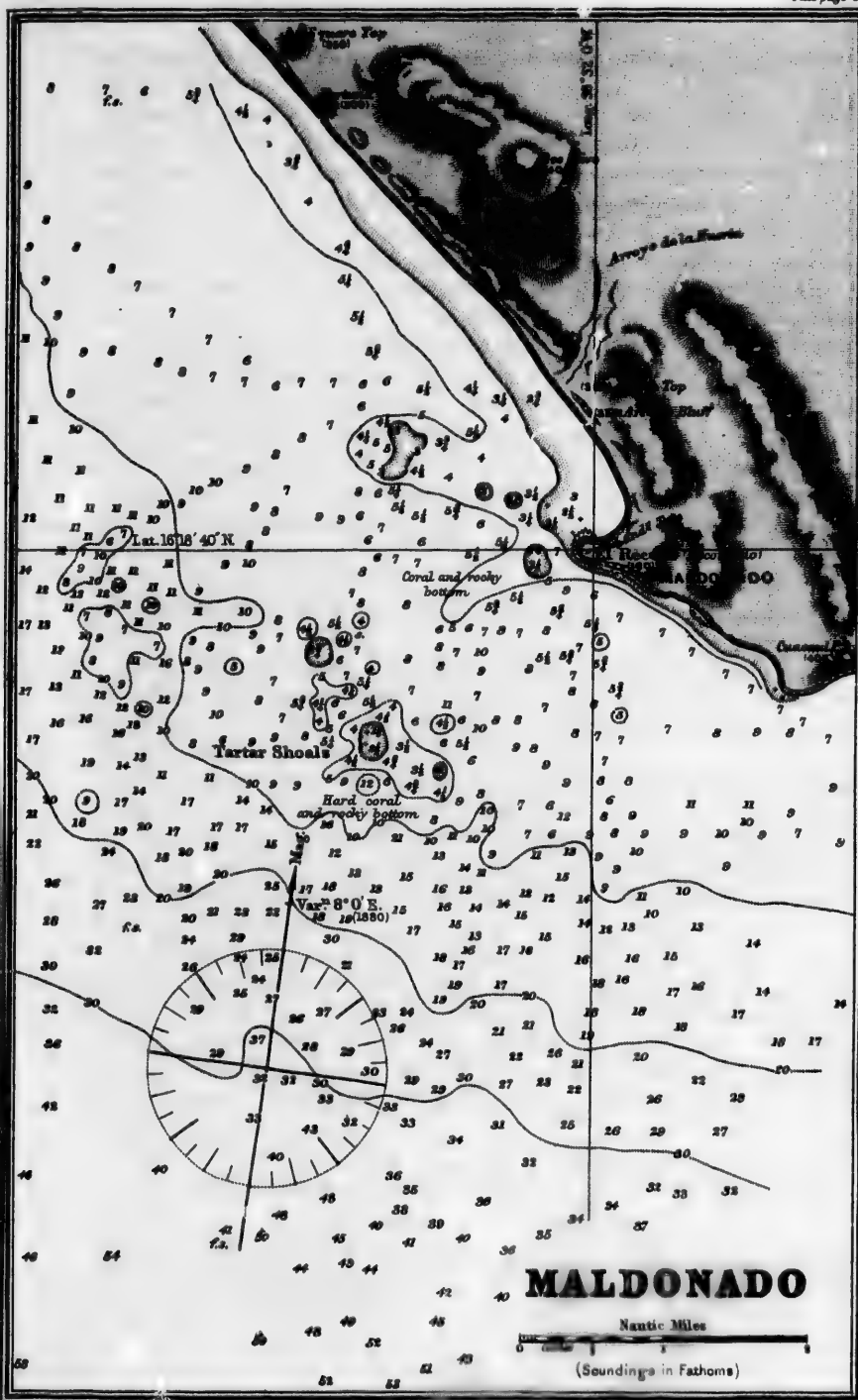
The coast to the westward of Maldonado has a sandy beach, and for a distance of six miles is composed of a series of sand cliffs, 200 to 300 feet high, divided by ravines, which render them good landmarks. The coast to the eastward is rocky for a distance of 2 miles, with the exception of two small spots, each of which has a sandy beach. Within a distance of one mile from the point are several sand cliffs, about 250 feet high, which are prominent and show white to the southward. The entire country in the vicinity of the point is 300 to 400 feet high and thickly wooded. Cuacaul peak, on the eastern side of the point and close to the sea, is 400 feet in height; the Bee Hive, 3 miles north-west of the point and nearly a mile inland, is of similar elevation.

As the high land and land near the coast are frequently obscured by smoke at the close of the dry season, navigators are apt to be deceived as to their distance from the coast. Hence it is considered prudent at this time of the year to keep the lead going and not pass inside the 20-fathom line.

About 2 miles south-westward of Maldonado point is a cluster of dangerous rocky patches known as the Tartar shoals†. They have recently (1878) been examined by

* Captain W. H. Parker, P.M.S.S. Co., 1871.

† Captain Miguel Gurrier, coast pilot at Acapulco, states, that from 2 to 3 miles off Cuacaul point (about 12 miles S.E. of the river Dulce and the first break in the sandy head to the eastward) there is deep water and anchorage in 8 to 10 fathoms; thence a shoal extends upwards of 4 miles seaward, breaking in the rainy season with S.W. gales, and having as little as 10 feet water on it,—and this information has been corroborated by the evidence of the captains of several coasting schooners.



the U.S. surveyors (see plan on Admiralty chart No. 587, 1870) and the following information is derived from their report.—

The shoals lying off Maldonado (Escondido) point, regarding 20 fathoms as the outside limit of danger, are included between the bearings from the point of S.S.E. $\frac{1}{2}$ E. 4 miles, and W. $\frac{1}{2}$ N. 5 miles. Within these limits the most dangerous rocky patches may thus be described :—A 8-fathom patch, extending E. by S. and W. by N. three-quarters of a mile, lies S.W. by S. 2 miles from the point, and near its western extremity are two rocks which have respectively $7\frac{1}{2}$ feet and $18\frac{1}{2}$ feet water over them. A 8-fathom patch less than half a mile in extent, with a rocky head, on which there is only 16 feet water, lies S.W. by W. $\frac{1}{2}$ W., 2 miles from the point. These two patches lie within a 6-fathom curve, with 9 fathoms all round. At about $1\frac{1}{2}$ miles W.N.W. $\frac{1}{2}$ W. from the point and about the same distance from the shore abreast is a shoal with 2 to 8 fathoms water over it and about half a mile in extent. On the southern extremity of this shoal lies the wreck of the steamer *City of San Francisco*.

For a distance of about 8 miles westward of the 5-fathom line the depths are irregular, varying from 6 to 11 fathoms, but beyond that distance the soundings increase gradually in a W. by S. direction to 40 fathoms, and in a southerly direction to 100 fathoms.

Note.—The actual dangers to navigation are situated between the parallels of $16^{\circ} 17'$ and $16^{\circ} 21'$ and the meridians of $98^{\circ} 85'$ and $98^{\circ} 40'$, but to ensure safety the caution not to pass inside the 20-fathom line should be carefully observed when passing these shoals.

Current.—The current sets in a south-easterly direction, varying between E. by S. and S.S.E., with a velocity varying from a half to 2 knots an hour; strongest on the ebb, E.S.E. Close into the point the flood sets to the northward and westward. It is said that during the wet season the current sets W. by N.

About 6 miles S.W. of Maldonado point very heavy tide-rips were observed by the surveyors; the depth in their locality was 18 fathoms.

Dulce River lies about 12 miles north-west of Maldonado point. A sunken rock is inserted in some charts opposite the river Dulce, on the authority of the ship *Clio*, at about 8 miles from the shore, in about lat. $16^{\circ} 28'$, long. $98^{\circ} 44'$; the depth around it is stated to be 6 fathoms.

ACAPULCO.—The port of Acapulco consists of a bay about $1\frac{1}{2}$ miles deep and having an extent from East to West of about 8 miles, in which are soundings of 20 to 10 and 7 fathoms. It is considered to be one of the finest harbours on the west coast of Mexico; and, for its size, one of the most complete in the world. It affords sheltered and land-locked anchorage in 16 fathoms water, over an extent of about one mile square. The bottom is sandy at its surface, but clayey beneath, and holds well.

All round the harbour, on every side are high mountains, which, on the north and east sides, range from 2000 to 2700 feet in height, and on the west side from 800 to

H.M.S. *Tartar*, when standing along this part of the coast on the 4th March, 1863, grounded on a shoal south-east of the river Dulce, in lat. $16^{\circ} 11'$, long. $98^{\circ} 32'$; the vessel's draught was 18 feet, but the least water obtained was $3\frac{1}{2}$ fathoms.

500 feet. They afford considerable shelter to the harbour, and may be seen at a great distance at sea.

Eastward of the port, and just outside the entrance, is a little bay named port Marques, having an extent of about $1\frac{1}{2}$ miles in an easterly direction. The soundings in it are 20 to 5 fathoms, mud, sand and rock, and there is good shelter from all but westerly winds, which blow directly in. Its southern point, named Diamante, has a reef extending from it a short distance; there is also a small islet or rock on the north side of the bay at about a cable from the shore, and at nearly the head of the bay is a sunken rock;—these can be easily avoided. Vessels seldom enter port Marques, the bay of Acapulco possessing superior advantages.

Westward of the port and also immediately outside the entrance, is an island named Roqueta or Grifo, which extends nearly East and West one mile and is of very irregular shape, but is about a third of a mile across in its broadest part, the middle. Its eastern and western extremities have each a reef extending seaward nearly $1\frac{1}{2}$ cables, parts of which are above water; in other respects the island is clear of any known sunken danger beyond a moderate offing. At a quarter of a mile from the island, there is a small islet or rock, 50 feet high, named Morro, outside of which is a depth of 20 fathoms. The passage between Roqueta island and the shore is about two cables wide, in its narrowest part, and has a depth of 16 to 20 fathoms; it is known as the Boca Chica, while the channel between the east and west points of the harbour is termed the Boca Grande.

At a third of a mile almost due east from the Morro islet, is a rock only 4 feet above the water, and having a depth close to it of 10 and 12 fathoms. Its position is a dangerous one to vessels making Acapulco from westward, and rounding Grifo island rather closely.

The town of Acapulco is on the west side of the port, and has long been in a state of decline, owing to the bad custom-house regulations, which cripple the energies of its merchants. Its market is but indifferently supplied; but fowls, and excellent fruit and vegetables, are readily obtained. Its position, according to the Admiralty chart No. 1944, is lat. $16^{\circ} 50' 56''$, long. $99^{\circ} 52' 15''$.

In the north part of the bay are some rocks named San Lorenzo, situated at a short distance from the shore, between which is no safe passage. About half a mile eastward of these is another rocky islet, called Obispo, of a white colour, and about 148 feet high. The depth on the seaward side of these rocks is 7 to 10 fathoms.*

Some mountains north-westward of Acapulco bay, named the Paps of Coyuca, are considered to be a good mark by which the situation of the bay may be known. The following remarks are by Captain G. H. Richards, R.N., of H.M.S. *Hecate* 1803:—

"The port of Acapulco is 90 miles in an E. by S. $\frac{1}{2}$ S. direction from Mangrove bluff, subsequently mentioned. In approaching it from westward the Paps of Coyuca are a good guide; they are two distinct conical summits, and the mountain is about

* A rock, nearly awash at low tide, was discovered some years ago in the northern part of Acapulco bay by the French ship *Serisuse* striking upon it. The depth over it was 15 feet (?) and the position assigned to it was, 1000 metres or 1093 yards N. 76° E., true, from fort San Diego, which places it nearly on a supposed line from the fort to Obispo islet.

4000 feet high; it lies N.W. by N. nearly 80⁺ miles from Acapulco, and 20 from the coast. The land westward of Acapulco is high. At the distance of 10 or 12 miles from the coast two distinct ranges are seen; the nearer one about 2500 feet high; and the more distant one, of which the paps form a portion, over 4000 feet. When the Paps of Coyuca bear N. by E. $\frac{1}{2}$ E., a red stripe, or land-slip will be seen on the coast right under them. A square table-topped mountain rises just westward of Acapulco, to between 2000 and 3000 feet. When within 8 or 10 miles of the port, Roqueta island is seen, which has a high, yellow, cliffy coast; as also the point of the main land northward, forming the entrance of the Boca Chica.

Diamante point, which appears as the eastern extreme of the land, shows as an island at the distance of 7 or 8 miles; the head of port Marques, of which it forms the south point of entrance, being low. Making Acapulco, from the south-west or southward, the entrance is remarkable, from the yellowish cliffs of Diamante point, and Roqueta island which may be seen at a considerable distance. The Paps of Coyuca are also seen, but the eastern peak appears cut off. There is also a white wooden tower on the summit of Roqueta island, which is used for a lighthouse and seen 6 or 7 miles off. The light is only exhibited when the Pacific mail steam company's vessels are expected."

Sir Edward Belcher, R.N., says "I cannot persuade myself that the Paps of Coyuca are useful for making the harbour, although in the offing they may be if not obscured. Acapulco may be approached from southward or westward, by keeping the western cone open of the land, which will lead up to the Boca Chica entrance, or until Acapulco port is so close under the lee, that no further marks are necessary. There is not any hidden danger in the entrance to Acapulco. Keep a moderate distance from either shore; 5 fathoms will be found alongside all the rocks, and 25 to 30 in mid-channel. Round point Grifo (the western point of the harbour) sharply, rather than stand over to San Lorenzo, as the wind, generally westerly, heads on that shore. If working, tack when the rocks on the south point of Town bay show in the gap.

The two best berths are off the rocks alluded to; that outside is preferable, but in either case let the outer rock bear W.S.W. or W.N.W., so that a hawser fast to the rock may keep your broadside to land or sea breezes, and prevent a foul anchor.

It would naturally be inferred that, as the harbour is surrounded on every side by high mountains, the breeze would scarcely be felt and the heat be intolerable. This is confined to the town limits; at our observatory, and at the port, San Carlos, we enjoyed a constant breeze.

In all harbours there may be objectionable berths, but in that of Acapulco, if care be taken to keep in the line of what I have designated the 'West Gap,' or neck of the peninsula, open of the south point of the town bay, both land and sea breezes will be felt in their full strength, and free from causes which would heat them before entering the port, the neck being but a few feet above the sea-level.

Water of good quality was found at several points between the fort and Obispo rock; but the two best streams are between the fort and San Lorenzo."

The following remarks are by Capt. W. H. Parker, P.M.S.S Co. (1871):—

"Making Acapulco from westward, take your departure from point Tajupan and

White Rock point, and steer for Morro Petatlan. Pass this point at a distance of 2 miles, and point Tequepa one mile. Run along the beach $1\frac{1}{2}$ miles off, and verify your position by taking the time when the bluff, 29 miles from the buoy at Acapulco, is abeam, and again by the ridge and peak 18 miles from the buoy. The light if shown will make a little on the port bow. Pass one-third of a mile from Grifo island, and with the starboard helm follow round to the buoy, keeping close to Grifo point.

The only outlying danger is the rock lying N.E. by E. $\frac{1}{2}$ E., three-eighths of a mile from the outer edge of Grifo island, in a line with point Guitarron. If very dark steer about E.N.E. (heading about for point Bruja) until point Grifo is abeam—then haul up sharp for this point and you will clear the rock whether you see it or not. You will be pretty sure, however, to see the breakers on it.

If there is no light on the buoy, steer midway between the two gaps in the land to the right of the Company's coal-sheds and you will find it.

If running for this port from eastward, take a departure from the White rock off port Angeles and shape a course to pass just outside of Tartar shoal; verify your position, and ascertain the vessel's speed by noting time of passing Morro Hermoso. Having passed the shoal, haul up about W. by N. $\frac{1}{2}$ N. for Potrero point. The current frequently sets strongly to the eastward, and you may be set in with the land about the river—21 miles from the buoy—in this case haul out, and remember that the trend of the coast thence to Petrero point is about N.W. by W. $\frac{1}{2}$ W. When the light bears N.W. by W. $\frac{1}{2}$ W. run for it, and you will clear Potrero point.

Pass one-third of a mile from Potrero, haul up and pass close to Bruja point, and then run across and pass close to Grifo point, and so to the buoy.

These points are readily distinguished in the darkest nights. There is no difficulty in leaving this harbour at any time."

M. de Petit-Thouars of the French surveying vessel *Venus*, 1888, says "The currents are not felt in the road, but, outside it they run to the S.E. with a strength varying from a half to 2 miles. This current is more rapid during the ebb.

In the fine season, that is to say from December to May, the land and sea breezes are regular enough. They are feeble during the night, coming from N. to N.E. and E.; and from S.W. to W.S.W. and to N.W. in the day. In the other months of the year this coast is dangerous, and but little frequented.

The usual anchorage is to the south of the fort, and before the town, in 11 to 18 fathoms, muddy bottom; it is perfectly safe. In case of necessity, anchorage can also be obtained in the Boca Grande."

It is high water at Acapulco on the days of full and change of the moon at 8h. 6m.; the rise of tide is about $1\frac{1}{2}$ feet. We believe that a small light is shown near the south-east end of Grifo island, when the steamers of the Pacific Mail Company are expected.

THE COAST.—From Acapulco bay the coast trends about 80 miles in a W. by N. $\frac{1}{2}$ N. direction to point Tequepa, on the eastern side of which is the river Coyuquilla. We have no information of this part of the coast until we get to Morro Petatlan, 20 miles farther to the north-westward, off which are some rocks named the White Friars from

their supposed resemblance to a cross. They have been described by Lord Anson, in the following manner:—

“The hill of Petatlan may be at first mistaken for an island, although it is in reality a peninsula, joined to the continent by a low and narrow isthmus, covered with shrubs and small trees. The bay of Sihuatanejo extends from this hill a great distance to the westward, and has, at its entrance, just off the hill of Petatlan, an assemblage of rocks, white with the dung of boobies and other tropical birds. Four of these rocks are high and large, and, together with several smaller ones, are, by the aid of a little imagination, made to resemble the form of a cross, and hence are called the White Friars.”

SIHUATANEJO is about 7 miles westward of Petatlan. It is a small but excellent harbour, of about a mile in extent, and open to all winds from south-westward. At its entrance are soundings of 10 fathoms, decreasing gradually towards the head of the bay, where there are $2\frac{1}{2}$ to $1\frac{1}{2}$ fathoms. It has been surveyed by Captain Kellett, R.N., who places it in lat. $17^{\circ} 38' 3''$, long. $101^{\circ} 30' 52''$. Lord Anson has described it in the following terms:—

“It is about 30 leagues westward of Acapulco, and may easily be found by keeping well in with the land, especially if sailing down the coast from Acapulco. There is a beach of sand extending 18 leagues from Acapulco to the westward, against which the sea breaks so violently that we found it impossible to land with our boats; yet the ground is so clean, that, during the fair season, ships may anchor in great safety, at the distance of one or 2 miles from the shore. The land adjacent to this beach is generally low, full of villages, and planted with a great number of trees. On the tops of some small eminences there are several look-out towers, so that, altogether, the face of the country presents a very agreeable aspect; for the cultivated part, which is the part here described, extends some leagues back from the shore, where it seems to be bounded by a chain of mountains, which extends a considerable distance on either side of Acapulco.

The beach described above is the surest guide to those seeking Sihuatanejo; for 5 miles westward of the extremity of the beach there is a hummock, which at first makes like an island, and is in shape not much unlike the hill of Petatlan, though much smaller. Three miles westward of this hummock is a white rock near the shore, which cannot easily be passed by unobserved. It is about 2 cables from the shore, and lies in a large bay about 9 leagues over, the west point of which is the hill of Petatlan.

The harbour of Sihuatanejo is easily distinguished by a large rock, $1\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from the middle of the entrance. I may add that this coast is no ways to be dreaded between the middle of October and the beginning of May, nor is there any danger from the winds. In the remaining part of the year, there are frequent and violent tornadoes, heavy rains, and severe gales, from all points of the compass.

These are the marks by which the harbour may be known by those who keep well in with the land; but there is no mark for those who keep at a considerable distance at sea, who must, consequently, make it by the latitude; for there are so many ranges of mountains rising one upon another inland, that no drawings of the appearance of the coast can be at all depended on, every little change of distance or position bringing new mountains into view, and producing an infinity of different prospects, which render all attempts at delineating the appearance of the land impossible.

The entrance of the harbour is but half a mile broad; the points which form it, and which are faced with rocks almost perpendicular, bear from each other S.E. and N.W. The harbour is surrounded on every side, excepting the western, with high mountains covered with trees. The passage in is very safe, on either side of the rock that lies off the entrance, though we, both in going in and out, left it to the eastward. The ground without the harbour is gravel mixed with stones, but within is soft mud. It is necessary, when coming to an anchor, to make a good allowance for a great swell, which frequently causes a great send of the sea; as, likewise, for the ebbing and flowing of the tide, which we observed to be about 5 feet, and to set nearly East and West.

The watering-place is at the head of the bay. During our stay it had the appearance of a large standing lake, without any visible outlet into the sea, from which it is separated by the strand. The origin of this lake is a spring, which bubbles out of the ground nearly half a mile inland. We found the water a little brackish, but more considerably so towards the sea-side; for the nearer we advanced towards the spring-head, the softer and fresher it proved. This laid us under the necessity of filling our casks from the farthest part of the lake, and occasioned us some trouble; and would have proved still more difficult, had it not been for our particular management, which, on account of its convenience, deserves to be recommended to all watering at this place. Our method consisted in making use of canoes drawing but little water; for, on loading them with a number of small casks, they easily got up the lake to the spring-head, and the small casks being there filled, were in the same manner transported back to the beach, where were some of the hands to put them into casks of a larger size.

Though this lake, during our visit, appeared to have no outlet to the sea, yet there is reason to suppose that in the rainy season it overflows the strand and communicates with the sea, for Dampier speaks of it as a large river. Indeed it is necessary that a vast body of water should be amassed before it can rise high enough to overflow the strand, since the neighbouring lands are so low that a great part of them must be covered with water before it can run out over the beach."

THE COAST.—From Sihuatanajo harbour the coast trends north-westward and westward about 56 miles to a low, well-defined point of land, named Mangrove bluff, situated in lat. $17^{\circ} 54' 5''$, long. $102^{\circ} 12' 41''$, and forms thereby a large open bay, at the head of which are what are termed in the charts, the Canuta or Salt-pits. Over the east side of Salt-pit bay is a high and very remarkable mountain.*

At a short distance from the north-west side of Sihuatanajo harbour, are three white islets or rocks, known as the Plancos islets, of which the easternmost is the largest; they are square in form and not unlike a haystack in shape; and are very conspicuous from the offing.

The depth at nearly 2 miles immediately south of Mangrove bluff is only 14 fathoms,

* A little river, the Sacatula, is represented in an old chart as falling into the sea on the east side of Mangrove bluff, but Captain Richards, R.N., says that if there is a stream it must be a very small one, for nothing of the kind could be distinguished from the mast-head at the distance of $1\frac{1}{2}$ miles.

on a shingle bottom, and this depth continues eastward of the bluff at the same distance from the shore, for about 3 or 4 miles, when it suddenly deepens. At 8 miles westward of the bluff, singularly enough there is a depth of 182 fathoms, on mud, at scarcely 2 miles from the beach.

From Mangrove bluff the coast trends W. by N. about 50 miles to a low cliffy headland, named Lizard point, in about lat. $18^{\circ} 11'$, long. $108^{\circ} 5'$, and is throughout nearly straight and without any remarkable feature. Some of the mountains close to the sea are 1100 feet high, and at 6 miles eastward from the point is one which rises to the height of 1500 to 2000 feet. The soundings at 6 miles westward from the bluff, and 8 miles off shore, are 60 to 70 fathoms, mud, which soon decreases to 40 and 35 fathoms, and this latter depth is maintained as far as 8 miles eastward from Lizard point at a corresponding distance from the land,—namely 3 miles.

From Lizard point, the coast (which is generally steep and rises abruptly to the height of 2000 feet) trends W. by N. $\frac{1}{2}$ N., a distance of 27 miles to Tejuapan bluff, a low point, with several large rocks or islets off it. Vessels frequently anchor here in the dry season, close inshore and inside of the islets. At 10 miles before reaching the bluff there is a bold projecting point of land, known as White Rock point, from the circumstance that three white rocks lie off it in an E.S.E. direction; inside of these rocks is a fertile looking spot with a village, and probably landing and shelter for boats.

At about 11 miles from the sea, and nearly midway between Lizard point and Tejuapan bluff, is the mountain named the Paps of Tejuapan. It is 5800 feet high, has a double nipple summit, and appears conspicuously to a vessel passing up or down the coast, but not so distinctly when viewed directly from seaward, as it is then overshadowed by the ranges of more lofty mountains behind it.

From Tejuapan bluff, the coast, composed alternately of sandy beach and high cliff, trends about N.W. to Black head, a distance of 18 miles. The hills rise in successive ranges parallel with the coast-line; those near the sea have an estimated height of 1500 to 2000 feet, while those farther inland are much higher. Black head, in lat. $18^{\circ} 36' 18''$, long. $108^{\circ} 41' 51''$, is a cliffy peninsula, connected to the shore by a sandy neck. A small white rock, 47 feet high, lies half a mile N.W. of the northern extreme of the peninsula, and a bay (where there is anchorage in fine weather in 14 fathoms at $1\frac{1}{2}$ miles from the shore) lies northward of the rock. There is also anchorage in 10 fathoms at about 7 miles south-eastward from the head, at one mile from the shore.

The depth at 8 miles off Tejuapan bluff is very great, as the bottom was not reached by the surveyors with a line of 172 fathoms, and this deep water was found to exist, at a similar distance from shore, for 26 miles eastward of the bluff or as far as Lizard point. Northward of the bluff, this deep water is succeeded by soundings of 55 to 40 fathoms, decreasing as Black head is approached, off which, at 2 miles due West, is a depth of 38 fathoms, sand.

The mountains in the interior of this part of Mexico are very lofty. That named Colima, 12,000 feet high, the summit of which is estimated to be in lat. $19^{\circ} 24' 42''$, long. $108^{\circ} 38' 1''$, is very remarkable when seen distinctly; but the haze, which generally hangs over the distant land, renders this seldom the case, and it therefore cannot be counted upon as a land-mark. It is a saddle-shaped mountain, having two

sharp conical summits, of apparently nearly the same height; the horizontal measurement between them from off Tejupan bluff is 45 miles.

Marnata, a new Mexican port, about 5 miles north-westward from Tejupan bluff, is situated on the north side of a creek communicating with a large lagoon and the sea. The village consists of the custom-house (a hut made of palm leaves) and four or five Indian huts. Its approximate geographical position, according to Commanders Mainwaring and Long, R.N., 1875, is lat. $18^{\circ} 27'$, long. $108^{\circ} 38'$.

The anchorage is bad, being exposed to all winds from seaward except N.W., and the shelter from that quarter is indifferent; the bottom is loose sand. Coasters anchor in $8\frac{1}{2}$ fathoms about 200 yards from the shore. Food is scarce and water bad. The locality is unhealthy. Communication with the interior is by bridle-paths only; the nearest town of importance is Colima, 150 miles distant. Brazil-wood is shipped during the fine season occasionally.

Gold diggings exist on the river Ostula, about 15 miles northward of Marnata, and silver mines near Cualeoman, a town situated 120 miles in the interior, and containing about 1500 inhabitants.

From Black head to the Sail rock, off point San Francisco, the eastern point of Manzanilla bay, the distance is about 48 miles in a W.N.W. direction. The coast between is low, being not more than 20 to 27 feet high, and is fronted by a sandy beach.

MANZANILLA BAY.—Manzanilla and Browning bays (the latter a small bay immediately north-westward of Manzanilla bay, from which it is separated only by a little narrow projection of coast, named Pelican point) have an extent together of about 5 miles in a north-westerly direction; from a supposed line connecting the outer points of these bays the coast recedes $8\frac{1}{2}$ miles. The soundings at the entrance are about 40 fathoms, and these decrease gradually to the beach, off which at a moderate distance is a depth of 5 to 8 fathoms. The village of Manzanilla is in the south-east part of the bay, and consists of only a few huts. Behind it is a large lake which, with the marshy land surrounding it, makes the port very unhealthy, especially in the fine season.

In Manzanilla bay there is good shelter from southerly winds but not from those directly from westward. Browning bay is open to southward, and is consequently safe only with off-shore winds. The anchorage in Manzanilla bay is at about a third of a mile northward of the houses, in 9 to 10 fathoms, and it is said that the ground holds well. When approaching either of the bays from westward, a good look-out must be maintained for the Sisters, a cluster of rocks above and under water, situated rather more than half a mile S.S.E. from Gowland point, the west extremity of Browning bay.

Manzanilla is the port of Colima, a large city about 90 miles in the interior, which is reported to have 80,000 inhabitants. It has been open to foreign vessels a great many years, but is still far from prosperous.

Manzanilla bay was surveyed by Captain G. H. Richards, R.N., in 1868, and the west end of the village ascertained to be in lat. $19^{\circ} 8' 18''$, long. $104^{\circ} 17' 41''$. He observes "The bay may be known by White islet, $2\frac{1}{2}$ miles westward of its western

point of entrance.* A high rock lies close off this point; and another white rock (100 feet high), resembling a sail, at a quarter of a mile off the eastern point. From the westward they are both remarkable. Approaching Manzanilla from westward, the Vigia Grande, a remarkable cone-shaped hill, will also be seen just inside the Sail rock; it is 740 feet high, and rises immediately over the anchorage. As neither the houses nor shipping can be seen from seaward, this is a good mark to steer for, passing from $1\frac{1}{2}$ to 2 miles outside the White islet, and the same distance from the west point of entrance, when the Vigia Grande will bear E. $\frac{1}{2}$ N., and may be steered for.

This course will lead more than a mile southward of or outside the Sisters, a group of five rocks, the largest of which is 10 feet high. They lie in a direct line between the west point of entrance and the Vigia Grande, distant from the former $2\frac{1}{2}$ miles. A very remarkable table-topped mountain, 2600 feet high, rises over the western point of the bay, and is an excellent guide for the port. The anchorage is immediately under the Vigia Grande, about a third of a mile from the village, in 9 or 10 fathoms water; over mud, and good holding ground.

The bay is safe with all winds except gales from West or S.W., which do not occur between the months of November and June,—the dry season, and singularly enough, the least healthy; fevers and ague prevail, more or less, at all times, but are more fatal during the dry season. It is not recommended to lie here more than four or five days at a time, and to take an off-shore berth, where the sea breeze will reach.

Fresh beef and vegetables, as well as other necessities, can be obtained here. Fresh water should on no account be received on board; it is desirable that the crews of vessels should land as seldom as possible, and not be exposed in boats when avoidable."

The following remarks on Manzanilla bay are from the work of M. Duflot de Mofras, 1844:—"Manzanilla or Salagua port is infinitely superior to the open roadsteads of San Blas and Mazatlan. It contains four excellent anchorages, and vessels of considerable draught of water can anchor in it at all times. To find the bay, when at a distance from the land, it is necessary to get into its latitude and then steer in for the coast, having as a landmark the double peak of the volcano of Colima. When near the port, the entrance of which is wide, it will be seen that it is divided into two bays by Pelican point which runs to the southward; the eastern bay is named Manzanilla; the western, Browning, and it is in this latter that the best watering place is to be found. When the wind is from southward, it is preferable to anchor in the *eastern* bay, which may be reached from the entrance by steering in a N.E. $\frac{1}{2}$ E. direction; the anchorage is in $6\frac{1}{2}$ to 9 fathoms opposite San Pedrito rock. The *western* bay may be reached by steering N.E. $\frac{1}{2}$ N., and passing the Frailes rocks, which surround the second point of Juluapau, the anchor should be cast in 5 or 6 fathoms behind the hill, at a short

* Known as Piedra Blanca, an islet 300 feet high, and in lat. $13^{\circ} 6'$, long. $104^{\circ} 27' 30''$, according to the chart of Captain G. H. Richards, R.N. It is 9 miles westward from the anchorage in the bay, and lies about one mile from the shore. It is a quarter of a mile long, appearing wedge-shaped when seen from westward, and remarkably white, being the resort of numerous sea birds. This islet is the mark for Manzanilla bay, and may be seen from westward immediately on rounding Navidad head, a distance of nearly 20 miles; it then appears just inside the extreme of the land. It can be seen easily from a vessel's deck at a distance of 15 miles, when bearing from E. $\frac{1}{2}$ S., round by north to W.N.W.

distance from the shore.* To attain the anchorage in this bay with a leading wind steer North a little easterly or westerly to avoid Pelican rock off Pelican point, which point it has already been observed is directly opposite the entrance. The tide occurs every 24 hours, the flood in the morning and the ebb in the evening; it rises about 7 feet, and the current runs to the southward.

Manzanilla is at about 20 leagues from the city of Colima, the capital of the territory of that name. The road from the sea is sufficiently good for carts, and the distance might be considerably diminished by means of a short cut which would place the port in communication with the salt lagoon of Cuyutlan, navigable by large flat boats. With the exception of frequent earthquakes (and *goitres*, with which the inhabitants of Colima are affected) there is nothing remarkable in the city; the population amounts to about 20,000, who are wholly occupied in agriculture and commerce.

At 8 leagues from Manzanilla bay in an E.N.E. direction is the volcano of Colima, the most western of the Mexican volcanoes. Its summit is 11,995 feet high; it is in activity and emits sulphureous vapours, cinders and stones, but no lava has flowed from it for a long period. The diameter of its crater is 492 feet, and its edge jagged. The sides of the mountain are barren and cliffy. The sulphur on it is of bad quality. At a league northward of the volcano there is an extinct crater, the summit of which is covered with snow; this is 690 feet higher, and consequently has an elevation of 12,690 feet. The great height of these mountains renders them visible from a considerable distance at sea, hence in clear weather they form an excellent means of recognising the land when approaching Manzanilla.

The valley in which Colima is situated is apparently formed of volcanic products and decomposed lava. No minerals are found in it, but only very beautiful specimens of porphyry. The vegetation of the plain consists of palms, aloes, pomegranates and fine orange trees. Upon the higher lands are forests of sombre pines, covering the part of the Sierra Madre which extends almost to Valladolid."

The following remarks are by Mr. G. H. E. Horn, of the Hamburg barque *Colima*, 1860:—"When making the port of Manzanilla, the white rocky island of Piedra Blanca is an excellent mark, as it is seen from a considerable distance, standing out in contrast with the darker hue of the coast behind and of the rocks near it. Having sighted this islet, bring it to bear about N. by W., when a lofty peak in the interior will bear N. $\frac{1}{2}$ W., you then have Manzanilla, behind point San Francisco, about N. 80° E., on which course steer for the port. Approaching the coast you will observe the heads of several islets and rocks that lie about 1 or 2 cables off shore and around which is deep water. From off point San Francisco, the bay has a regular decreasing depth from 27 fathoms outside to 5 fathoms within a cable's length of the shore. Give this point a good berth, as off its extremity, at the distance of about 80 yards, there are several rocks, above and under water; it is also advisable not to carry more sail than necessary to keep steerage way on the vessel, for the harbour of Manzanilla being small you must anchor almost immediately you have passed the point. When at the anchorage

* The Sisters rocks appear to be in the way of this course. See the plan of Manzanilla bay in the Admiralty chart No. 510.

vessels can moor in perfect safety within half a cable of the beach ;—it will be much in your favour to bring up as near the shore as possible, as you can then discharge and load with greater rapidity. Making the bay you must not expect to see an inhabited place of importance ; to the westward, in the small harbour of San Antonio,* there is a rancho of eight or nine huts, while to the eastward, in the harbour of Manzanilla, is the town of the same name, containing a few houses and about fifty huts, but these are not visible until you have rounded point San Francisco. The harbour is quite safe in both seasons.

The crews of vessels frequently suffer from sickness here, occasioned by exhalations from the great swamps near Manzanilla ; added to which there is no good water to be procured in the harbour."

Captain W. H. Parker, P.M.S.S. Co (1871) gives the following directions for making Manzanilla :—" In making Manzanilla from the westward it is better to get hold of the " Frailes," then Navidad head, Cape Graham and White island—passing about one mile from these points. The only out-lying danger is the Sister rock, about half a mile off Gowland point. If very dark or thick, you can easily make sure of avoiding this rock by keeping over towards the starboard shore—run five miles from White island and then haul up, bringing the Sugar Loaf (Vigia Chico) on your starboard bow ; as you pass this close to, the lights of the town will open. Should there be no light on the buoy, it may be found by steering (about E. by S. $\frac{1}{2}$ S.) directly for a high peak with which the buoy is in line.

Bound into Manzanilla from the eastward pass point Tejupan at a distance of two miles, and verify your position by taking the time when Black head is abeam. You have then but 42 miles to run to Manzanilla point, and there is nothing to excuse your running by the harbour. Manzanilla point is a bluff headland, and you will be sure to see it if you keep *close enough* to the shore. Sail rock will make out to the left of the point, unless you are set off, in which case it will be *on* with the point and cannot be seen.

Pass one-third of a mile from the rock and point, and follow the land round with a port-helm to the buoy. It is all a bold shore."

THE COAST.—From Manzanilla bay the coast trends W. by N. about 20 miles to cape Graham, the south point of Navidad bay, situated in lat. $19^{\circ} 10' 30''$, long. $104^{\circ} 40' 30''$. Throughout nearly the whole of this distance (for 18 miles eastward of the cape) it consists of a low shore, not more than 15 or 20 feet high, fronted by a sandy beach, and having behind it a lagoon. In the interior the land rises in distinct ranges to between 3000 and 4000 feet. On this sandy beach boats may generally land during fine weather, and there is safe anchorage in 18 fathoms at half a mile from the shore.

Cape Graham is about 700 feet high and has a high peaked rock close to it, as well as a smaller one, which, however, do not readily appear as detached from the land from any position that a vessel would be in. There is also a small rock (12 feet above low water and always visible, being a few feet above the surface at high tide) at about half

* We suppose that this is Browning bay of Captain Richards' chart.

a mile S.W. from the cape; on account of this rock, some care is required when approaching Navidad bay from south-eastward.

NAVIDAD BAY is formed by cape Graham and a very white projecting point of land named Harbour point, $2\frac{1}{2}$ miles N.N.W. from it. It has soundings shoaling from 25 fathoms at the entrance to 6 and 5 fathoms at a short distance from the beach, or sand. The anchorage is in the north part of the bay, in 6 to 7 fathoms, under Harbour point, which protects it from south-west winds. At nearly 6 miles westward from the anchorage is a bold headland, named Navidad head, which is a conspicuous point of land especially when viewed from north-westward. Navidad head and bay are thus described by Captain G.H. Richards, R.N.;—"Navidad head is a wedged-shaped summit, about 400 feet high, falling in shore to a low neck, and is remarkable when seen from any direction. On approaching it within 8 or 4 miles, it is seen to be an island, separated from the main by a low rocky ledge, which the water rises over. Off the head are three remarkable rocks, extending in a south-west direction; the centre one being white with a smooth round top, covered with vegetation, and about 70 feet high. These rocks give the head some slight resemblance to Farralone point, with the Frailes rocks (9 miles westward from it) when seen from the north-westward; but the peculiar shape of the wedge island would prevent the possibility of a mistake after the first glance.

The White rock of Navidad has been mistaken for the White islet of Manzanilla by strangers, and accidents have occurred in consequence, but this mistake could only have arisen in the absence of any chart. The Navidad rock is small, the centre of three, and stands off a prominent headland. The White islet of Manzanilla, 20 miles to the south-eastward, is very much larger, remarkably white, and stands alone, a mile from the shore, but, being rather in a bight, cannot be seen projecting from any position a vessel would be in. Besides the three high rocks off Navidad head, there is a sunken one, which occasionally breaks, and lies S.E. $\frac{1}{2}$ E. from White rock, distant a short mile.

After rounding Navidad head from the northward at the distance of 2 miles, the white sandy beach of Navidad bay will be seen, bearing E. by N., distant 7 miles. At 2 miles southward from the White rock of Navidad there are 60 fathoms water, and steering thence for the anchorage it gradually shoals to 40 and 30 fathoms. The north beach of Navidad bay is in lat. $19^{\circ} 18'$, long. $104^{\circ} 41' 25''$.

As the bay is approached, Harbour point, a very remarkable high white point, will be seen on the northern shore. Immediately round and inside this is the anchorage, a very fair stopping place during the fine season, but it is not recommended for a sailing vessel at other times, as there is a difficulty in getting out with a S.W. wind;—the best berth is in 7 fathoms water, sandy bottom, with Harbour point bearing S.S.W. a quarter of a mile, and the same distance from the eastern shore of the bay,—sailing vessels may anchor farther out, with the point bearing West, in 10 or 11 fathoms, but there will be more swell.

A single house stands in the north hook of the bay, and a lagoon within a few yards of the beach, where the water is fresh, and the natives say good, but it is not recommended to use it unless a vessel is in distress. At the south-east end of the bay is the north-west end of a long lagoon which here opens into the sea; a strong stream runs out of it, and there is sufficient depth for boats at half tide. There is a small

village here, and some supplies of fresh provisions may be obtained. The anchorage off this end of the bay is not recommended."

TENACATITA BAY.—From Navidad head the coast turns sharply northward for about 4 miles, and then trends westerly about 5 miles to Brothers point, the coast between these headlands forming a large bay named Tenacatita. The direct bearing and distance of Brothers point from Navidad head are N.W. by W. $\frac{1}{2}$ W. 5 miles. Brothers point has a rather remarkable double hill immediately over it, which from northward appears like an island; off the point is a high, square, perpendicular rock, and there are also some smaller ones about it above water, and others farther out which from their position are dangerous. The most dangerous of the known rocks are the Porpoise, 7 feet above water, lying $1\frac{1}{4}$ miles W. by S. from the point; and another, upon which the sea breaks, S.E. by S. $8\frac{1}{4}$ cables from the point. On account of these rocks, Brothers point should have a berth of 2 miles.

Tenacatita bay is about $2\frac{1}{2}$ miles deep, and is said to contain one or two rocks in its north-west part. It has not been minutely examined, and should consequently be entered with caution. It is asserted that there is good anchorage in its north-west corner, where protection may be obtained from winds from north-westward. Sheltered anchorage may be found off the village, on the east side of the bay, during the wet season, and in West bay during the dry season. Tamarinda bay, on the east side, also affords a secure anchorage, but there is more swell than off the village.

Tenacatita bay is considered preferable to Manzanilla as an anchorage, and is said to be more healthy. It is easy of access, and appears free from hidden dangers, with the exception of the rocks off Brothers point. The soundings are regular and the rocks appear steep-to. After passing the line joining Brothers point and Tenacatita head, do not approach the west shore within half a mile nor the eastern shore within a quarter of a mile. If bound to West bay, pass eastward and northward of Bird islet, which is 10 feet high and has 3 fathoms water close-to.

A good berth off Tenacatita village is in 10 fathoms, with the village open northward of the outer rock off Breakwater point and Flat rock (8 feet high, and having 8 fathoms close-to) showing a little inside Tenacatita head. From the berth recommended the water shoals regularly toward the shore, and a vessel loading may, if desired, anchor closer in 7 fathoms.

Water may be procured either near the village or in Tamarinda bay. Fire-wood is abundant. Cattle abound in the vicinity of the bay. Coquita nut shells are abundant.*

PERULA BAY.—From Brothers point the coast trends about 18 miles in a north-westerly direction to Flat Top point, the south extremity of Perula bay, which may be easily recognised by the remarkable flat-topped mountain, 1100 feet high, which rises over it and is conspicuous from northward and westward. When running along this shore, the Frailes, situated about 5 miles from Brothers point, will present themselves to view as two needle-shaped rocks from 80 to 100 feet high; and at about 7 miles from these is a low projecting point named Farralone.

Perula bay is formed by Flat Top point and a projection of the coast nearly 7 miles

* The above information respecting Tenacatita bay is mainly derived from a report by Com. S. Long, H.M.S. *Fantome*, 1875.

north-westward from it, named Rivas. In its north-west corner there is excellent anchorage in 8 to 9 fathoms, sand, but unfortunately it is directly open to southerly winds, which frequently send in a very heavy sea. According to Captain G. H. Richards R.N., whose description of the bay we subjoin, the position of Rivas point is lat. $19^{\circ} 84' 31''$, long. $105^{\circ} 6' 38''$.

"Perula bay, a spacious and convenient anchorage, is easily recognised from any direction by two islands, which lie in the centre of it; the northernmost of which, Passarera, 180 feet high, is remarkable from its perpendicular white cliffs which are seen from a long distance. Colorada, the southern island, is rather lower, and has a slightly reddish appearance. The best anchorage is in the northern part of the bay. The entrance is between Rivas point and Passarera island, and is a mile in breadth; the depth of water from 15 to 18 fathoms.

Rivas point is bold and cliffy, with some detached rocks $1\frac{1}{2}$ cables off it, the outer one of which is 80 feet high. From this rock a reef, 2 feet above high water, and on which the sea always breaks, lies East, distant $1\frac{1}{2}$ cables, with deep water close to it. There is anchorage anywhere within a line between Rivas point and Passarera island, in from 10 to 14 fathoms water, but the most sheltered is with the high rock off Rivas point bearing S.W. by S., distant about half a mile, or midway between it and the sandy beach on the eastern side of the bay, where there are 4 and 5 fathoms at $1\frac{1}{2}$ cables from the beach. Small vessels may anchor in the northern bight of the bay, and be more out of the swell.

At the south-east end of the bay, nearly 4 miles from Rivas point, is the village of Chamela. Vessels wishing to anchor near it should enter between Colorada island and the small islands to the south-east of it; this channel is two-thirds of a mile wide, and free from danger. Large vessels may anchor in 8 fathoms, with the south point of Colorada island bearing S.W. by W., and the village of Chamela just open of San Pedro island, midway between the island and the shore of the bay. Small vessels may anchor in 4 fathoms inside Cocina island, where they will be two-thirds of a mile from the village; inside this it shoals rapidly, and off the village there is only one fathom water.

From Passarera island a bar extends to the opposite sandy point of the bay, distant two-thirds of a mile; the least depth of water on it is 8 fathoms, so that vessels of greater draught cannot pass from the northern anchorage to the southern part of the bay, but must go outside the islands. The bottom is sandy, but good holding ground. During the fine season, from November till June, the sea breeze from N.W. is regular during the day, and the land wind at night, and the anchorage is perfectly safe; but with S.W. or S.E. winds a heavy swell sets into every part of the bay.

Supplies of fresh beef, pumpkins, and water-melons may be had at the village, by giving a day's notice; there is also good water from a stream close to it. Dye-wood is exported, but of an inferior quality."

THE COAST.—From Rivas point the coast trends N.W. $\frac{1}{2}$ N. about 60 miles to cape Corrientes, and the land throughout is lofty, rising into peaks of 500 to 1100 feet elevation. When sailing down this coast from north-westward, it will be observed that a sandy beach commences immediately southward of the cape. Soundings of 45 to 55 fathoms may be obtained at 8 miles from the land, when 4 miles southward of the cape, and whenever a sandy beach line is met with, a depth of 19 or 20 fathoms water will

generally be found within a mile of it, where vessels may anchor if necessary. This coast is not considered safe between June and the end of November, during which time S.E. and S.W. gales are prevalent, bringing in a heavy sea.

Between 5 or 6 miles southward of cape Corrientes is a rather dangerous reef, known as Cucharitas. That part of it above water projects from the land westward about $1\frac{1}{2}$ miles, and consists of three or four small rocks, against which the sea breaks heavily. Two sunken rocks are stated to exist about half a mile outside these; hence the coast hereabout should not be closely approached. The land is somewhat low about Cucharitas, but rises at a short distance from the beach.

CAPE CORRIENTES is a bold and lofty headland, with rather a flat summit, which rises to the height of between 2000 and 3000 feet; hence it is visible from a great distance at sea. Its extreme point is estimated to be in lat. $20^{\circ} 25'$, long. $105^{\circ} 39'$. From northward and westward it does not present a remarkable appearance, but from southward it is bold and projecting. There are no known sunken dangers off it, and the sea is very deep in its immediate vicinity, as the surveyors when 4 miles westward from it failed in touching the bottom, although sounding 106 fathoms.

CAPE CORRIENTES TO MAZATLAN.

Magnetic Variation in 1879:—At Banderas Bay $9^{\circ} 10' E.$; San Blas $9^{\circ} 20' E.$; Tres Marias Islands $9^{\circ} 25' E.$; Mazatlan $9^{\circ} 40' E.$ The annual increase is estimated to be 2 or 3 minutes.

BANDERAS BAY.—At cape Corrientes the coast trends N.E. by E. $\frac{1}{2}$ E. 28 miles, then northerly about 8 miles, and afterwards almost West to a narrow projecting point of land, known as point Mita; the bearing and distance from the cape to the point being N. by E. $\frac{1}{2}$ E. 24 miles. The space included within these limits is the bay of Banderas, which may be considered to have an extent of about 20 miles from West to East, and to be 17 to 9 miles broad. The southern coast of the bay as far as the river Real at its head, a distance of 28 miles, is high and precipitous, with occasional valleys, through which small fresh-water streams descend to the sea. From this river to point Piedra Blanca, about 11 miles to the northward and westward, the shore is low, sandy and covered with bushes; it then rises into broken bluffs 10 to 20 feet high, with occasional sand-beaches, which continue as far as point Mita. The bay in nearly every part is exposed to the full force of westerly winds, the only places of shelter being in Corralies harbour, and off its northern shore under point Piedra Blanca. At a very short distance from its southern coast there is no bottom at 50 fathoms, but a bank extends from its northern shore a considerable distance, the depth being 22 fathoms at about 3 miles south-westward from point Piedra Blanca. It is believed to be clear of any sunken rocks except the reefs off point Iglesia, mentioned subsequently.

Corralies.—At about 2 miles eastward from cape Corrientes is the little harbour of

Corralies, in which vessels can anchor and obtain shelter from all winds except those from north-westward; but as only fine breezes ever come from that quarter, its protection may be considered complete. The entrance is free from danger beyond a few yards from the shore, and there is deep water almost close to the rocks or coast; the harbour also so singularly resembles a basin or slip in its perfect smoothness and safety, that a large ship could anchor near the land and get out fast, thus lying in perfect security. The land rises abruptly around it, particularly to the southward and westward. There were no inhabitants in 1869, and it was believed to be destitute of fresh water. The country in its vicinity is heavily timbered.

The depth in the middle of the basin or inner harbour is about 80 fathoms, and within an oar's length of the beach 1 fathom; near the rocks within the same distance, it is 7 fathoms, sandy bottom. The water is wonderfully clear, consequently any sunken rocks can be readily seen. The only disadvantages of the bay are, it is small and very deep.*

Point Iglesia, about 4 miles N.E. $\frac{1}{2}$ E. from cape Corrientes, may be easily recognised by a castellated rock which stands out from the land nearly a mile, and viewed from westward appears like an irregular cube. Outside this rock, perhaps a mile, are two reefs 9 feet under water, over which the sea breaks occasionally. On account of these reefs it is advisable to give this part of the coast a berth of at least 2 $\frac{1}{2}$ miles.

Ylapo.—From point Iglesia the coast trends 1 $\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. to point Chimo, then E.N.E. $\frac{1}{2}$ E. 4 $\frac{1}{2}$ miles to point Teiomala, and afterwards E. $\frac{1}{2}$ N. 8 $\frac{1}{2}$ miles to Ylapo harbour, at the mouth of a small river of the same name, which is only a break in the rocky shore extending into the land about half a mile. From seaward the harbour appears broader than that of Corralies, and its depth of water is probably not so considerable. It is stated to be free from sunken dangers, and to afford good shelter from S.W. gales. Vessels anchor in 15 to 20 fathoms, and obtain supplies of water from the river.

From Ylapo harbour the coast trends E.N.E. $\frac{1}{2}$ E. 8 $\frac{1}{2}$ miles to Quemisto, a bight with a sandy beach in which partial shelter from south-westerly winds can be obtained. Here are, or were (1860), numerous large houses or barracks which are used as quarters for the men employed to load ships with log-wood.

From Quemisto to the Boca de Tomatlan the distance is about 8 miles E. $\frac{1}{2}$ S. This harbour is very small, being merely a dock or slip in the rocks at the mouth of the little river Tomatlan. It is of more limited extent than Corralies harbour, and quite as deep; it will consequently accommodate only very small vessels.

About 2 miles eastward of the Boca de Tomatlan are three rocks near the shore, named Arcos, the largest of which is 210 feet high. The others are 20 and 80 feet high respectively.

Penas.—Four or five miles northward from the Arcos rocks is the mouth of the river Real, where is the village of Penas, which is frequented for dye-wood. Here

* Commander George Dewey, U.S. Navy, does not report so favourably of Corralies harbour. He says "it is impossible to anchor there. A sunken rock, on which the sea breaks in rough weather, lies off the harbour about 3 cables from the shore." Probably this is one of the reefs off point Iglesia.

vessels anchor during favourable weather close to the beach. Excellent fresh water can be obtained from the river.

From Penas the coast trends 4 miles northward and north-westward to the Boca de Tomates, the outlet of a lake which receives the river Valle or Piginto; and, then, north-westward 7 miles to point Piedra Blanca, under which vessels occasionally anchor in 4 to 10 fathoms during north-westerly winds. From this anchorage to point Mita the distance is about 8 miles.

Point Mita.—Point Mita, a low, narrow, projecting point, is dangerous in consequence of the numerous outlying rocks and reefs in its proximity, one of which (under water) lies half a mile southward from it, and occasionally shows its presence by breakers. About a mile inland from the point is a prominent hill, 590 feet high. Vessels frequently anchor in about 7 fathoms on the south-east side of the point, at about $1\frac{1}{4}$ miles from its extremity, and obtain shelter from north-westerly winds; it is considered to be an excellent anchorage.

Tres Marietas.—About three miles S. by W. $\frac{1}{4}$ W. from point Mita, and separated from it by a clear navigable channel 8 to 24 fathoms deep, through which vessels may safely pass by keeping nearer the islands than the coast, are the two largest Marieta islands, neither of which is so much as half a mile in extent. The eastern of these is 179 feet high; the western 182 feet. The third islet, a white rock 40 feet high, is distant 7 miles S.W. by S. from the point. A small rock, only 15 feet high, lies half a mile westward of the last-mentioned islet.

In the channel between the second Marieta islet and the third islet, the outermost, there is a very dangerous rock, only one foot above the surface at high water, which must be specially guarded against. It lies in nearly midway, being rather nearer the second islet than the third.

Corventena Rock.—The Corventena, believed to be the outermost of the rocks to seaward of Banderas bay, is distant 17 miles W. by S. $\frac{1}{4}$ S. from point Mita, and 21 miles N.N.W. $\frac{1}{4}$ W. from cape Corrientes; it is 8 cables in extent, east and west, of whitish appearance and only 25 feet high. Its geographical position is lat. $20^{\circ} 44' 10''$, long. $105^{\circ} 47' 30''$. From its western side a reef extends a short distance.*

THE COAST.—From point Mita the coast trends N.N.E. $\frac{1}{4}$ E. 22 miles to point Raza, and is bold, with occasional sand beaches. Off it at a moderate distance is a depth of 9 to 22 fathoms, the latter being about a mile from the land. Between points Mita and Raza, and 9 miles distant from the latter, is Monterey point, off which is a sunken rock. The coast range of hills, rising 800 to 1000 feet, borders on the sea throughout

* Much to our surprise, in the afternoon we approached a small black (?white) rugged rock, or, more properly speaking, a closely connected cluster of small rocks. The space they occupy does not appear to exceed the dimensions of a large ship's hull, nor are they much higher. They are at a great distance from any land, and, so far as we could perceive in passing them,—at the distance of about half a league,—the water near them appeared to be deep in every direction. We could not gain soundings close round them with the hand-line, nor did this small rocky group seem to be supported by any bed of rock or shallow bank. The shores of the main land, eastward of them, at the distance of about 8 leagues, appeared to be broken, and about 10 miles within them are two small islets. These rocks, according to our observations, lie from the southernmost of the Marias, S. 86° E. (true), at the distance of 12 or 13 leagues. Vancouver.

the whole distance; behind it are lofty mountains, of which the Cerro Vallego has an altitude of 5086 feet. Point Raza, a reddish-coloured point about 80 feet high, is the south-western boundary of Jaltemba bay, an open roadstead in which vessels sometimes anchor with south-easterly winds.

At about 2½ miles eastward of point Raza, and a mile from the shore, there is a small islet 80 feet high, between which and the beach vessels anchor and load dyewood.

Ten miles N. by E. ½ E. from point Raza is the little bay of Chacola, in which small vessels occasionally anchor; and 10 miles N. by W. from this is point Custodios, where a river falls into the sea.

From point Custodios the coast trends N.N.E. 7 miles, and for the greater part consists of bold cliffs 75 to 100 feet high; it then sweeps round in a curve to the N.W. by W. ½ W. to point Camaron, the eastern point of the Estero San Christoval. The bay thus formed is known as that of San Blas. It is an open bay, exposed throughout its whole extent to westerly and south-westerly winds, and we believe contains no safe anchorage. The mountains immediately behind it rise to the height of 1000 and 1500 feet, and 10 miles in the interior, in the direction of N.E. by E. ½ E. from point Custodios, is the saddle mountain of San Juan, which is 7550 feet high. When viewed on the bearing of E. by S. the two peaks of this mountain are strikingly conspicuous. Port San Blas is within the entrance of the Estero de Arsenal.

SAN BLAS.—The town of San Blas is on the summit of a rather steep hill about 450 feet in height; it is now of little commercial importance, the increasing trade of the neighbouring port of Mazatlan having caused the principal merchants to remove thither.* Eastward and westward of the town is a stream; that westward of it, known as the Estero del Arsenal, is fronted by a bar of 7 to 8 feet water†, immediately within which is a depth of 12 to 18 feet and it is here that small vessels occasionally anchor;—that eastward of it, the San Christoval, is almost dry at low water. The west point of the Estero del Arsenal has a reef extending from it along the coast in a north-westerly direction nearly three-quarters of a mile, parts of which are above water. As the depth close to this reef is 12 to 18 feet, rapidly deepening seaward to 4½ fathoms, care is necessary to avoid it when approaching the port from north-westward.

Piedras Islets.—At nearly a mile S.W. from the port of San Blas is a rock or islet 55 feet high, known as the Piedra Blanca de Tierra, near to which are two smaller rocks, the whole lying in a N.E. and S.W. direction and surrounded by shoal water, immediately outside which is a depth of 5 fathoms. And, about 11 miles W. ½ N. from the Piedra Blanca de Tierra is the Piedra Blanca del Mar, a small white rock 145 feet high and 420 feet long, in the immediate vicinity of which is a depth of 9 to 12 fathoms. These rocky islets are excellent marks for the port of San Blas. The last mentioned

* In 1865 the town of San Blas was in ruins and the population had almost disappeared.

† The depth on the bar at the entrance to the Estero del Arsenal at low water is 12 feet, and 16 or 17 feet at high water. Vessels must moor head and stern in the Estero, the channel being very narrow; once inside, ships are sheltered from every wind. *Commander George Dewey, U.S. Navy, 1874.*

Islet is in lat. $21^{\circ} 34' 45''$, long. $105^{\circ} 27'$; from it mount San Juan is distant 30 miles in the direction of E. $\frac{1}{2}$ S., and the mouth of the river Santiago 5 miles E. by N. $\frac{3}{4}$ N.

Directions.—In making the port of San Blas the saddle-peaked mountain of San Juan (7550 feet high), 18 miles E. by S. from the town, is an excellent mark. It should also be borne in mind that the land to the southward of the port is high, while to the northward it is low.

Vessels approaching San Blas from southward should keep westward of Corventena rock, although the wide channel between it and the Marietas may probably be safely traversed, as it is believed to be free from sunken dangers beyond what are represented on the chart. Approaching from north-westward, they should pass the Piedra Blanca del Mar on the south side, and steer thence for the Piedra Blanca de Tierra, pass it also on its south side, and thence steer for the anchorage, where a berth may be selected at convenience. The reason for the recommendation to go southward of the islets is that a shoal extends about 8 miles from the coast in the vicinity of the Santiago river, on parts of which is a depth of less than 8 fathoms.

Anchorage.—The usual anchorage at San Blas is in $4\frac{1}{2}$ fathoms, sand, at nearly half a mile eastward of the Piedra de Tierra, or farther out in $5\frac{1}{2}$ fathoms at about the same distance south-eastward from that rock. If the former anchorage be preferred, a good spot is at half a mile S. $\frac{1}{2}$ W. from the low rocky point of the harbour, with the two Piedras in one. The roadstead is very much exposed to winds from S.S.W. to N.N.W., hence ships should always be prepared for sea, unless it be in the months in which northerly winds are settled. In the event of the wind veering to westward, and a gale from that quarter being apprehended, no time should be lost in slipping and endeavouring to get an offing, as a vessel at anchor is deeply embayed, and the holding-ground is very bad. In case of necessity, a vessel may cast to westward, and stand between Piedra de Tierra and the Fort bluff, in order to make a tack westward of the rock; after which, it will not be necessary again to get northward of a line connecting the two Piedras.

The anchorage should not be frequented between the months of May and December, because, during that period, the coast is visited by storms from southward and westward, attended by heavy rains, and thunder and lightning. It is, besides, the sickly season, and the inhabitants having all migrated to Tepic, no business whatever is transacted at the port.

Supplies of fresh beef, vegetables, wood, and water may sometimes be obtained here. The latter, of excellent quality, is found in the Ensenada Matenchén, $2\frac{1}{2}$ miles eastward of San Blas. (1874).

Tides.—It is high water at San Blas on the days of full and change of the moon at 9h. 45m. Spring tides rise about $6\frac{1}{2}$ feet.

The following notes, made on a passage to San Blas, are by Lieut. Sherard Osborn, R.N., 1846:—

"Supposing a vessel, bound to the western coast of Mexico, safely round Cape Horn, and rounding before the southerly gale which almost constantly blows along the shores of South America, she ought to shape a course so as to cross the Equator in about 98° or 99° W. long., so that when she gets the *North-east Trade* she will be at least

6° or 7° eastward of her port,—San Blas or Mazatlan ; and have at the same time a sufficient offing from the Galapagos islands to avoid their currents and variable winds.

We crossed in 105° long., having been recommended to do so by some old merchants at Valparaiso, and were consequently, although a remarkably fast-sailing ship, a lamentably long time making the distance.

Our track led us to be exactly in the same longitude as our port, when we got the *Trade*, and it hanging well to the northward, we were consequently increasing our distance, until in the latitude of San Blas, when an in shore tack, of course, shortened it. But, by the course I have recommended, the *first* of the North-east Trade will drive the vessel into the meridian of her port, and she will thus daily increase her distance.

Care must be taken when standing in for the land not to go to leeward of San Blas, as there is a strong southerly current along the coast, especially off cape Corrientes.* If possible keep San Blas on an E.N.E. bearing. The Marias islands, off the port of San Blas, are convenient points for making ; and here a master could leave his vessel in perfect safety to water, while he communicated with his consignees, or got his overland letters from his owners at home. There is a safe mid-channel course between the middle and southern islands ;—we brought a saddle-shaped hill on the main a little south of San Blas, one point open of the south island, and steered by compass N.E. by E.

The two Piedras are excellent marks for the roadstead, which, by Beechey, is in lat. 21° 32' 20", long. 105° 15' 15". A good anchorage for vessels awaiting orders (for which purpose San Blas is now almost alone visited, except by English men-of-war, and Yankee clippers), will be found with Piedra del Mar, N. 70° W. ; Piedra de Tierra, N. 48° W. ; and the village in the Estero, N. 26° W.

Since the days of Hall and Beechey, the town of San Blas has very much changed. Its population of 20,000 has dwindled to 8000 residents, and their unwholesome appearance fully accounts for the decrease of residents ; and nearly all its trade has been transferred to its rival—Mazatlan.

The large town of Tepic, in the interior, with a small factory, owned by an English merchant, causes a small demand for European luxuries, and a cargo or two of cotton ; which petty trade is carried on during six healthy months in the year. A great deal of smuggling is carried on from the neighbourhood of this port, the extensive bay, to the southward affording great facilities to the men-of-war's boats in that employment.

The town is built on the landward slope of a steep hill, which is almost perpendicular to seaward, and has its crest crowned by the ruins of a custom-house ; but as this is about three-quarters of a mile from the beach a large assemblage of huts has been formed at the landing-place, in the Estero del Arsenal, for the convenience of supplying the shipping ; the occupants being, for the most part, grog-venders, fishermen, and an agent to the harbour master.

* In reference to the currents in the neighbourhood of cape Corrientes, Commander W. H. Parker, P.M.S.S. Co. (1871) says :—" I must caution you against one of the most marked currents on the coast ; the current running from cape Graham (the east point of Navidad bay) along the coast, towards cape Corrientes, generally about N.W., but sometimes setting North, with considerable velocity into Navidad, Tonacatita and Perula bays." This statement would lead one to expect a northerly current in the vicinity of cape Corrientes.

In the Estero del Arsenal, small craft, of less than 10 feet draught, will find convenient anchorage, means of heaving down, &c. The watering-place is, at least, 8 miles from the above anchorage; and to assist the boats in this heavy work, it is always advisable to shift the vessel into such a position that they may make a fair wind off and on whilst the daily sea-breeze blows.

The watering-place is at the northern extremity of a large open bay, south of San Blas; the beach is shoal, and the casks have to be rolled 800 or 400 yards through the jungle to a stream of water. This stream, during the spring tides, is occasionally brackish; but we succeeded in obtaining supplies, by immersing the empty cask with the bung in such a position that only the fresh water (which, of course, would be on the surface) could enter.

By rigging triangles with spars in such a position that the boats could go under them to load, we succeeded in embarking daily 82 tons of water.

Many useful and ornamental woods are to be procured on shore, for the mere trouble of cutting, especially *lignum vitæ*. Fresh beef we found good in quality. Game moderately plentiful; oysters good and plentiful; vegetables scarce and expensive. The climate may be summed up by the word 'execrable.'

On November 1st, the dry season commences; the temperature rises steadily, and the land yields all its moisture, until, by the month of May, the heat of the atmosphere resembles that of an oven, and the air swarms with mosquitoes and sandflies. The sky is cloudless, the land and sea-breeze regular, but not refreshing.

Early in June, heavy banks of dark lowering clouds, charged with electricity, collect on the high lands in the interior, lowering masses of clouds hang to seaward. The change is fast approaching, and before the 16th of June the rains commence and deluge the land, accompanied by heavy squalls and a tumbling swell from seaward. All vessels now leave the coast unless able to take shelter in the estero; though of late, men-of-war, in eager search for freight, have held on, and found that the gales do not, in the winter, 'blow home.' At this season all the inhabitants, whose means afford it, quit the coast for the interior.

For the first month, or six weeks, the parched land absorbs the rain; but, by the middle of August, it becomes moist and swampy;—the haunts of alligators and aquatic birds. In September the action of the sun on water-soddened land generates fever of the most violent nature, and it behoves those who arrive early in the dry season to be careful of exposure to the malaria."

The following notes on San Blas are from the work of M. Duflot de Mofras, 1844:—The roadstead of San Blas is open and exposed. The anchorage is safe in the dry season and less dangerous during the rainy months than that of Mazatlan. The extent and configuration of the roadstead renders an approach to it easy, and when leaving it the prevailing current often affords considerable assistance. It is recommended to avoid remaining in it during the season of the *cordonazos*. The harbour has the great advantage of being a little bay, called *el pozo*, which is closed in and sheltered from the sea by a natural jetty of rocks. In this harbour there is considerable accommodation for careening; it is however to be regretted that there is not room for more than five or six vessels, which should not be of a greater draught than 10 feet or they will be unable to cross the bar.

It is very easy to make San Blas, so many landmarks serve as guides. After having doubled the Marias islands, which are about 60 miles to seaward of the port, a course may be steered for the land, and mount San Juan will be seen to the eastward. This mountain is about 7550 feet high and situated in about lat. $21^{\circ} 26'$; behind it is the town of Tepic. When steering for the mountain, the Piedra del Mar or Afuera cannot fail to be recognised as it is an enormous white rock about 150 feet high, and soon after passing it at a short distance on its south side, another white rock will come into view, named Piedra de Tierra or Adentro; this latter is the smaller rock, and exactly marks the anchorage. It is eastward of the Piedra de Tierra where the anchor should be cast, in about $8\frac{1}{2}$ (?) fathoms.

The anchorage may be run for either during day or night. The two Piedras are nearly East and West from each other, distant about 11 miles. All the coast of the bay is quite clear from reefs and the soundings are regular. While under sail it is necessary to take notice of the direction of the current, which runs southward, sometimes with considerable strength.

San Blas is very unhealthy, especially during the rainy season when malignant fevers prevail. There are clouds of mosquitoes and gnats whose stings often cause painful eruptions, ophthalmic complaints, and serious inflammatory disorders;—hence shipmasters should not permit the sailors to sleep on deck, on shore, or in any place where they will be exposed to these disagreeable pests.

Merchandise discharged at San Blas supplies the district of Colima. Some goods are sent to Mazatlan, Durango, San Luis Potosi, and to Zacatecas. The vessels usually return in ballast, but occasionally go either to Mazatlan or Banderas bay for brazil-wood. If they arrive at San Blas in July, August or September, or even later in the year, the cargoes are more easily disposed of than in the earlier months, as they are then forwarded to the fair of San Juan de los Lagos and are privileged with a discount of 58 per cent upon the charges of entry. San Juan de los Lagos is situated upon the road from Mexico to Guadalajara, at 40 leagues from the latter city; it is a small place, but its fair is very important, as it continues 8 days and receives goods not only from Mexican territory but also from Guatemala.

Seasons, Winds, &c.—The year is divided into the dry and rainy seasons, the changes into which take place generally and at variable periods. During the dry season the weather is constantly fine. The winds prevail regularly during the day from N.W. to West, following the direction of the coast and are replaced at night by a light breeze from the land or by a calm.

The rainy season, which commences in June, is at first indicated by calms and slight showers; as the season advances the showers become heavier and more frequent, and instead of prevailing only at night they commence in the afternoon and terminate in very violent tempests accompanied by thunder and lightning and violent winds from all quarters of the horizon. This weather continues till the end of September and it frequently occurs that the season is terminated by a violent hurricane, which usually takes place from the 1st to the 5th of October, the period of the fête of Saint Francis. These storms, which always prevail from S.E. to S.W., are of short duration; but their violence is so great, and the sea which accompanies them so high, that nothing can

resist their influence;—hence they are known in the country by the term *cordonzos de San Francisco de Asis*.^{*} When overtaken in the roadstead by one of these storms the anchor should be immediately raised, or the cables cut, and the vessel run ashore (*sic*). At the approach of the *cordonazo* the offing should be run for, or if obliged to anchor in the roadstead it should be at such a distance from the land that it will be easy to get away on the first intimations of its commencement. These observations are not applicable to roadsteads entirely open, for such should be avoided during the months of September and October. Occasionally the *cordonazo*, contrary to the experience of seamen, occurs later than St. Francis' day; for instance, on November 1st, 1839, twelve vessels supposing the season to have passed, were surprised in the port of Mazatlan and were almost entirely destroyed. On November 1st, 1840, three vessels, under a similar error, were lost in the roadstead of San Blas, and several people were drowned, without it being possible to render them any assistance.

Although this coast is within the region of the N.E. trade, yet such is its configuration that a S.W. wind occupies its place in the Gulf of California; it is not however felt on the coast northward of lat. 28°."

Isabel Island.—This barren islet is situated in lat. 21° 52' 80", long. 105° 50', or about 40 miles W.N.W. from San Blas. It is nearly 2 miles in length, N.W. by N. and S.E. by S., 280 feet high, and about half a mile wide. There are several detached rocks near it, the most conspicuous of which are two pinnacle rocks, nearly white, near its north-eastern side. On the eastern and south-eastern sides of the islet are sand-beaches, where boats may land in good weather. The soundings in its immediate vicinity are 15 and 21 fathoms and it is believed to be clear of sunken dangers beyond the distance of a quarter of a mile from the rocks.*

MARIA ISLANDS.—These islands lie about 70 miles to the westward of port San Blas, between latitudes 21° 16' and 21° 46', and are three in number,—but really four, if San Juanito, a large low rock of table form, situated about 4 miles northward of the northern island, is included. They are known to the coasters as the *Tres Marias*. Among and around them are many small rocks, whose heads are just above the water.

Maria Madre, the northernmost of the large islands, is 11 miles long, and 8 to 6 miles broad. It lies in a S.E. and N.W. direction,—which is also nearly the line in which the islands lie from each other. Its height is sufficiently great to render it visible at the distance of nearly 18 leagues. Its highest part, near the middle, is estimated to be 1694 feet, whence there is a gradual descent to the north-west extremity, a low projecting point. Off this end of the island a dangerous reef extends nearly a mile toward San Juanito island. Its south-eastern extremity also terminates in a low projecting point, with some rocks lying off it. There is tolerable anchorage off the south-eastern part of this island, and a beach to the eastward of the south point, where boats may land in good weather.

* *Cordonazo*—Spanish—Stroke with a cord or rope.

† Isabel Island is of moderate height, nearly barren, and its herbage and grasses can scarcely be distinguished. Neither wood nor water are to be obtained from it. The beach is lined with rocks, with the exception of a small sandy cove open to westward, where boats may be hauled up on the shore. The island is only frequented by sealers. *Du Petit Thouars*, tome 11.

San Juanito, the northernmost and smallest of the group, lies 2 miles north-westward of Maria Madre island; it is $2\frac{1}{2}$ miles long, N. by W. and S. by E., and 150 feet high. A reef extends off its south-eastern side nearly a mile toward Maria Madre, rendering the channel between them very dangerous. A white rock, 150 feet high, lies a mile off its western side.

Between this island and Magdalena island, the next to the southward, is a passage about 5 miles wide, with soundings of from 12 to 22 fathoms, sandy bottom, which is believed to be free from sunken dangers.

Magdalena island is about 8 miles long, east and west, and 2 to 4 miles wide; on its southern side are several detached rocks. The shores, in general, but more so on its northern and eastern sides, descend gradually from the centre of the island (whose summit is 1090 feet in height), and terminate at the water-side in a fine sandy beach. This island is more verdant than the other, as its vegetable productions extend from the more elevated parts to the sea, and grow with some luxuriance, although its soil is principally of a sandy nature. The chief valuable production is *lignum vitæ*; besides which there is an almost impenetrable thicket of small trees and bushes of a thorny nature, together with the prickly pear, and some plants of the orange and lemon tribe; the whole growing as close to the water-side as the wash of the surf permits. A variety of fish, common to the tropical regions, abound about the shores.

Cleopha, the south-easternmost island, is nearly circular and only about 8 miles in diameter. Its highest peak has an altitude of 1820 feet. A pinnacle rock, 100 feet high, lies about three-quarters of a mile off the south-east point, and a white rock, 225 feet high, half a mile off its western side.

When navigating around these islands, some detached rocks are visible about their shores, but all are sufficiently conspicuous to be avoided; and there is reason to believe, from the regularity of the soundings, that secure anchorage may be obtained against the prevailing winds, at a convenient distance from them. These islands are of volcanic origin. The western sides of all of them consist of high inaccessible cliffs, perfectly barren, while the eastern sides are generally low and sandy, with plenty of vegetation.

Of these islands, Captain Beechey R.N., says :—

"The Tres Marias, situated $1^{\circ} 15'$ west of San Blas, consist of three large islands, steep and rocky to the westward, and sloping to the eastward, with long sandy spits. Off the S.E. extremity of Magdalena island (the centre of the group), we found the soundings decreased rapidly from 75 fathoms to 17; and that after that depth they were more regular. At 2 miles from the shore we found 10 and 12 fathoms, bad holding-ground. There is nothing to make it desirable for a vessel to anchor at these islands. Upon Magdalena there is said to be water of a bad description; and the landing is in general very hazardous.

There are passages between each of the islands. The northern channel requires no particular directions; that to the southward of Magdalena is the widest and best; but care must be taken to avoid a reef lying one-third of a mile from its S.W. point, and a shoal extending $1\frac{1}{2}$ miles from its south-eastern extremity. I did not stand close to *Cleopha* island, but could perceive that there were breakers extending fully three-

quarters of a mile from its S.E. extremity; and I was informed at San Blas, that some reefs also extend 2 to 4 miles from its south-western point. There is an islet off the north-west part of this island, apparently bold on all sides; but I cannot say how closely it may be approached."

The Coast.—From San Blas the coast trends about N.W. $\frac{1}{2}$ N., 120 miles to Mazatlan, and is for the most part low, and covered with trees. It is believed to be clear of sunken dangers beyond a moderate distance from the beach. In the vicinity of Mazatlan the sea is said to be deeper at a corresponding distance from shore than it is near San Blas.

Santiago River, 8 miles W. by N. $\frac{1}{2}$ N. from the entrance to San Blas harbour, has off its mouth a dangerous shoal which extends nearly 8 miles toward Piedra Blanca del Mar, leaving a safe passage by keeping near the rock.

Asadero Estero.—Four miles northward of Santiago river is the entrance to the Asadero estero. Here vessels come for cedar, dye-wood, &c., and anchor in 5 or 6 fathoms half a mile from the beach.

Camichin Estero, about 8 miles farther northward, is also resorted to by vessels for cedar, dye-wood, &c. The anchorage is in 5 or 6 fathoms water half a mile from the shore.

Boca Tecapan.—From the entrance of the Camichin estero the coast trends in a N.N.W.-ly direction 45 miles to the Boca Tecapan, the barred mouth of an extensive lagoon, into the northern part of which the river Bayona flows. The anchorage is about 2 miles off the entrance to the estero, in 6 or 7 fathoms. The approximate geographical position of the boca is lat. $22^{\circ} 30'$, long. $105^{\circ} 41'$.

There are two channels leading into the estero, with 2 fathoms in the northern and $2\frac{1}{2}$ fathoms in the southern, at *high* water. The sea breaks over the bar even in moderate weather. The best time to enter is in the early morning before the sea-breeze springs up. There is a small Indian village near the entrance, where tolerably good fresh-water may be obtained.

Chamatla River.—This river is distant 24 miles N.W. $\frac{1}{2}$ W. from Boca Tecapan; in the dry season it is navigable only by small boats or canoes. Its west point of entrance, according to Lieut. E. Belcher, R.N., is in lat. $22^{\circ} 47' 30''$, long. $105^{\circ} 58'$. Near the mouth of the river are the Chamatla hills, 500 to 800 feet high. A few miles up the river are the small towns of Chamatla and Rosario. The anchorage is in 6 or 7 fathoms, a mile off the entrance. The depth on the bar is, we believe, usually about 4 feet at low water.

About 18 or 20 miles from the coast is a mountain range from 2000 to 3600 feet high and behind it another still higher.

From the entrance to Chamatla river the coast trends N.W. $\frac{1}{2}$ W. 34 miles to Mazatlan. All this coast is low and sandy, and covered with bushes. There are no known outlying dangers, the water deepening gradually from the shore to 10 or 12 fathoms 2 miles distant. Midway between Mazatlan and Chamatla river, and 9 or 10 miles from the coast, is a remarkable sierra, from 1200 to 1760 feet high, known as La Cabeza de Caballo.

Satron River, 10 miles southward of Mazatlan, like the Chamatla, in the dry season is only navigable by small boats. The mouth of this river is in lat. $23^{\circ} 6'$, long. $106^{\circ} 15'$.

When beating up the coast between San Blas and Mazatlan, the lead should be frequently hove, as the soundings are an excellent guide and give a good indication of the near vicinity of the land. Some of the low hills upon the shore, 27 miles from Mazatlan, are shaped like cones. The current has a southerly set, at the rate of 18 to 20 miles per day, but its direction and velocity are much affected by the prevailing wind.

MAZATLAN.—The river Mazatlan is about half a mile wide at the entrance where the harbour is, and so very shallow that it can be entered only by small vessels at high tide. The sands are nearly all dry at low water, at which time the depth over the bar is only about 6 feet, and in the channel within 9 to 12 feet.*

This port is easy of recognition, in consequence of the many islands with lofty conical peaks in its vicinity, there being no other port on this part of the coast which is fronted by a group of islands.

In 1827 the harbour of Mazatlan was surveyed by Captain Beechey, R.N., since which time it is believed that considerable changes have taken place in the depth of water, hence a pilot's assistance is indispensable to vessels entering the port. Large vessels anchor outside, in 4 to 6 fathoms water, to the southward of Creston island, hereafter described. This anchorage is sheltered from N.W. winds, but the bottom is said to be hard and not good holding.

Mazatlan has of late years supplanted the harbour of San Blas in its commercial importance. The town stands on the west bank of the river, about a mile within the entrance. During the busy season it has a population of 14,000 to 15,000, but less at other times of the year. To the southward of the town is a pier extending off the custom-house. Between the pier and the fort there are several dangerous sunken rocks, hence it is necessary to give the shore a good berth here, and make for the head of the pier. A signal station is established on the hill (200 feet high) behind the fort.

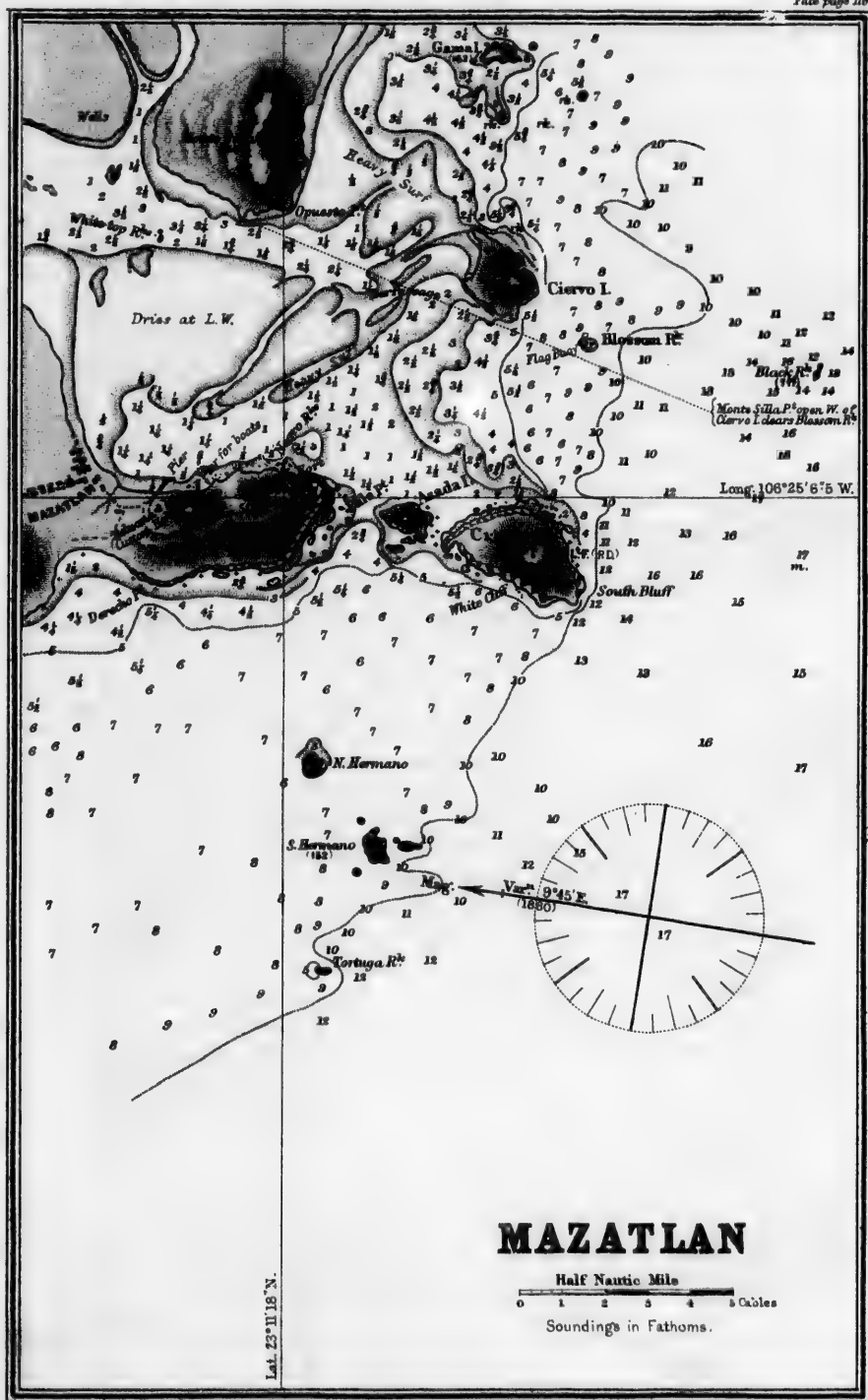
Lighters are employed for loading and unloading, the charge for which is 20 to 50 dollars. Custom-house dues &c., are high. The wants of a ship can be supplied but the prices are excessive; and only rain water is obtainable. The ballast consists of sand and shingle.

The principal exports are silver and other minerals. A large quantity of the former is sent to San Francisco, coined and in bar.

There is a hospital at the town, which is of great utility during the rainy season, as severe fevers are then common.

Creston Island is small but lofty and of roundish form; its seaward side is perpendicular, giving it the appearance of a white cliff. Near its southern extremity it rises to a conical peak, 484 feet in height. Bluff point, its southern extreme, is, according to Captain Beechey, R.N., in lat. $23^{\circ} 11' 40''$, long. $106^{\circ} 28'$. In the rocky channel

* Shipmasters bound to the port should be provided with the Admiralty chart by Captain Beechey, R.N., (No. 1876), and to this chart we must refer our readers, as a written description will not convey so good an idea of the port as an inspection of the chart.



between this island and the mainland to the northward is Azada island, with rocks adjacent.

Black Rock, 7 feet high, lies about three-quarters of a mile S.E. from the summit of Creston island, and about the same distance S. $\frac{1}{2}$ W. from Ciervo island. The latter, 250 feet high, is situated on the east side of the harbour's entrance, and has shoal water, over which the surf breaks heavily, between it and the mainland. About half a mile eastward of Ciervo is Gama island, 162 feet high, having numerous rocky islets and shoals in its vicinity.

Blossom Rock, distant about a quarter of a mile S.W. by S. from the highest point of Ciervo island, has only 10 feet water over it. It is (or was) guarded on its north side by a flag-berry.

At two-thirds of a mile north-west of Creston island, are two rocky islets known as the *North* and *South Hermanos*, lying N.E. and S.W. of each other and a quarter of a mile apart. The latter has several rocks about it and at a quarter of a mile W.N.W. from it is the *Tortugas* rock, about 5 feet above water. The soundings between these islets and Creston island are 6 and 7 fathoms.

Pajaros and *Venado* islands, 360 and 510 feet in height respectively, are situated about 4 to 5 miles N.W. of Creston island. Venado is of irregular shape, and distant about two-thirds of a mile from the shore, to which it is joined by a flat of $2\frac{1}{2}$ fathoms. It is not so lofty as Creston, but has a very similar appearance, and both islands can be seen from seaward a considerable time before the land behind the town of Mazatlan comes into view; hence they are good marks when approaching the port directly from southward. Pajaros island lies about a mile N.N.W. from Venado, and is also connected to the shore by a flat of $2\frac{1}{2}$ fathoms or less. All the coast within these islands is low and sandy. The low beach commences at the bluff point of Mazatlan river and extends some miles north-westward from the islands. Between these islands and the main is a roadstead where vessels occasionally anchor. This anchorage is considered preferable during the rainy season to that southward of Creston island, as, unlike the latter, it is sheltered from southward and south-westward.

Winds.—During the summer or rainy season, which generally lasts from the middle of June to the end of October, the prevalent winds are from the South and S.W.; they frequently blow with great violence, rendering the anchorage off Creston island highly dangerous. During the winter or dry season N.W. winds are the most common and it is at this season that vessels are able to visit port Mazatlan with safety. The direction and strength of the current greatly depends on the wind.

During the stay of the steamer *Narragansett* from the 6th to the 18th February (1878) north-westerly winds were experienced during day and calms at night. The thermometer ranged between 70° and 75° Fahr.

Tides.—It is high water at this place at 9h, 40m., full and change; spring tides rise 7 feet.

The following remarks on Mazatlan are from the work of M. Duflot de Mofras, 1844:—"Mazatlan is distant from San Blas about 120 miles; the navigation between is very easy and usually occupies 2 to 5 days. The intermediate coast is everywhere safe, and has off it at a moderate distance a depth of 6 to $7\frac{1}{2}$ fathoms, and at some miles in the offing 38 to 55 fathoms.

The roadstead of Mazatlan, like that of San Blas, is open and exposed, although in the dry season a vessel may anchor in it in security and find protection from the prevailing winds, which are then always from N.W. and from seaward. During the rainy season, the port is extremely perilous; if at this period a vessel be driven on shore, it would in all probability become a total loss, for the coast is strewn with rocks against which the sea breaks with violence.

Large vessels anchor south of the town, and are sheltered on the west side by Creston, a small but very lofty islet on the north-west side of the roadstead; this islet is separated from an island north of it by a channel only a few fathoms wide, and this last islet is itself only a cable from the land. When approaching the port directly from seaward, the object of recognition is Creston islet, which appears isolated; to the north-westward of it are two islets named Venado and Pajaros, which are also useful marks.

The anchorage at Mazatlan at present resorted to is southward of Creston island, but the islets just mentioned form with the coast a roadstead which in former days was much frequented by Spanish vessels and which is certainly to be preferred during the rainy season. In this latter roadstead, there is shelter from southward and south-westward and the vessel, if need be, can get to sea either through the channel between the islands or between them and the coast; but as during the dry season the prevailing north-westerly winds are there very much felt, and the heavy seas they raise break on the beach with great violence, the discharge of cargo is rendered so difficult and dangerous that vessels now prefer the roadstead southward of Creston where these inconveniences are not experienced.

The port of Mazatlan has been opened to foreign commerce for some years; the official name applied to it by the Mexican government is *La villa de los Costillas*. Its population amounts to about 15,000 during the rainy season, but is much larger during the dry season or the period when foreign vessels arrive, for at that time the merchants of the provinces of Chihuahua, Sonora, Colima, Sinaloa and Durango, resort to it to make their purchases. The trade is almost entirely in the hands of foreigners who realize considerable profits.

The town of Mazatlan is open on all sides, having neither fortifications nor batteries, a few indifferently equipped soldiers forming the entire garrison.

Ships ought to get their water in the peninsula which forms the south side of the road; everywhere else it is brackish. Although Mazatlan is less unhealthy than San Blas, severe fevers are common during the rainy season, and as there is no hospital in the town, shipmasters should be strict in not allowing their men to run into any excesses, which might be followed by dangerous consequences.

Mazatlan is the only port in this part of America, north of Guayaquil, where a ship can procure a complete supply of provisions. A bullock costs 8 or 12 piastres. Flour from Guaymas, which is excellent, is from 12 to 14 piastres for 12 arrobas (805 lb English). Sail-cloth, pitch, tar, cordage, chains, anchors, and timber, partly from wrecks) may be procured in the stores (1840).

At 10 leagues eastward of the port, on the road leading to San Blas and Tepic, and 3 leagues from the sea, is the old presidio of Mazatlan. This village is now scarcely more than a ruin; for since the removal of the trade to the port, it has lost all its

military importance. There are no vestiges of the old fortifications, and the fine barracks built by the Spaniards only serve now to shelter a few cavalry soldiers; the population is about 500. The Rio de Mazatlan which runs near the presidio, and falls into the harbour, is not navigable."

The following notes made on a passage from San Blas to Mazatlan, are by Lieut. Sherard Osborn, R.N., 1846, "Leave San Blas with the first of the land breeze, and after passing Piedra del Mar, endeavour to steer such a course as to be enabled to make a good in-shore tack with the sea breeze on the morrow, taking care not to stand closer to the shore than 6 fathoms in a large vessel, or 5 fathoms in a smaller one; or, should the sea breeze be found to have much northing, stand well off, when a continued wind instead of the land and sea-breezes will be obtained, and the strong southerly set in-shore be avoided. The *Collingwood* made the in-shore passage in April, 1846, and had light airs with frequent calms, being generally too far off shore at night to benefit by the land-breeze; she consequently was five days going 120 miles, whilst the *Spy* did it in two and a half days by going well to seaward.

Mazatlan is easily recognised by the two bluff headlands which form the entrance to the river, the northern and more conspicuous of the two, Creston, being an island, and affording a little shelter from the northerly breezes which prevail from January to May. To the westerly and southerly breezes it is perfectly open, and has the only recommendation of being good holding ground. The coasters run up the river off the new town of Mazatlan, which has risen to considerable importance within a very recent period, notwithstanding the disadvantages it labours under from the poverty of supplies, both animal and vegetable; and from water being both bad and scarce.

Mazatlan is now the outlet for the products of the valuable mining district of San Sebastian, and imports directly and indirectly large cargoes of English goods. The general healthiness of the climate, as compared with its more ancient neighbour San Blas, has materially tended to an increase of its population. The town, from being built on the crests of some heights, clear of mangrove and swamp, had an air of cleanliness and pure ventilation rare in this part of America.

Vessels must invariably moor in the roadstead, open hawse to the W.S.W. but too close a berth to Creston island is not advisable, as the squalls sweep over it with great strength. The *Collingwood* drove, though she had 50 fathoms on each cable.

Watering is attended with great risk at all times at this place, especially at full and change, the boats having to cross the heavy surf of the bar, formed between a long spit which runs down the centre of the river, and a bank joining it from the south shore. Several boats and lives are annually lost here. When pulling in care should be taken to cross the surf pretty close to the middle ground; and when through the first rollers, to pull over to the south shore, and keep it on board up to the watering place. In coming out, no casks ought to be allowed in the head sheets, everything depending upon the buoyancy of the boat; inattention to this point, caused the loss of two lives, to my own knowledge.

The water is procured from a number of wells dug by seamen, on a low alluvial island, formed on a quick sand in the bed of the river; none of them are consequently more than 10 feet deep. The water is by no means sweet, but merely sea water, which undergoes a partial purification in filtering through the soil.

Supplies of all sort come from the neighbourhood of San Blas; and as the bullocks are driven that long distance, and as on arrival they are instantly killed, from the want of grass, the beef is necessarily lean and bad. Pork, fish, and oysters are however plentiful; vegetables are scarce. The river abounds in turtle of excellent quality; wood of various descriptions, principally hard, was plentiful, and at a short distance oak and cedar might be obtained.

Old Mazatlan, which lies about 20 miles up the river, was well known to ancient navigators as far back as 1587. "Master Thomas Cavendish in the tall shippe *Desire*, 120 tons, refreshed his gallant company before cruising off cape Lucas, for a Spanish galleon; and Don Sebastian Vizcaino, in an expedition to convert the Californians to the Catholic faith, recruited his squadron in the Bahia de Mazatlan."

The following remarks on the anchorage at Mazatlan are by Captain W. H. Parker, P.M.S.S. Co., 1871:—A good berth is in 8 or 9 fathoms water, with South bluff, Creston island, bearing W. by S. $\frac{1}{2}$ S., Black rock S.S.E., and the town of Mazatlan N. by W. $\frac{1}{2}$ W.

To pick up this anchorage from the westward, pass Creston island at the distance of half a cable, and steer E.N.E. Ciervo island will then be a little open on the port bow; and when Black rock is abeam (S.S.E.) and the town of Mazatlan two-thirds of a point forward on the port beam (N. by W. $\frac{1}{2}$ W.), drop anchor. The town will come into view only a short time before it is time to anchor.

To pick up this anchorage from the southward, pass west of Black rock distant one cable, and steer N. $\frac{1}{2}$ W. The town will then be in view, a little on the port bow. Stand on until Creston island (South bluff) is half a point abaft the port beam (W. by S. $\frac{1}{2}$ S.) and the town of Mazatlan about half a point on the port bow (N. by W. $\frac{1}{2}$ W.), when anchor.

In both cases, be sure to keep Monte Silla well open westward of Ciervo island, so as to keep clear of Blossom rock.

The above, I think, will be found a good anchorage during the greater part of the year, and with the marks I have given can be taken up with great facility.

Should you wish to anchor nearer the town, steer about N. $\frac{1}{2}$ E. from the position above given; but the lead must be kept going, and be sure not to open Azada island with Pala point.

The objection to going too close in, is the difficulty of getting under weigh in a large ship, as there is but scant room for manœuvring.

During the bad season, September and October, you may wish to anchor farther out; but you will be governed by the weather and the length of your stay.

It is not possible to mistake the port. Creston is a small but very high island, running to a sharp point—a very remarkable cone. Ciervo and Gama islands are very small, in fact, large, conical white rocks.

The current between Isabel island and Mazatlan is probably generally to the southward.

Off Mazatlan, the soundings are very bold. I have sounded with 60 fathoms line—no bottom—15 miles off shore.

Should you arrive off the port at night you will see the lights of the town to the northward of Creston island."

GULF OF CALIFORNIA.

Magnetic Variation in 1879:—At the entrance of the Gulf about $4^{\circ} 50'$ E.;

Guaymas Harbour $11^{\circ} 30'$ E.; mouth of Colorado River 18° E.;

Ballenas or Whale Channel 12° E.; La Paz Bay $10^{\circ} 20'$ E.,

The annual increase is estimated to be 2 to 3 minutes,

GENERAL REMARKS.—The entrance to the Gulf of California may be considered to be between Mazatlan on the east, and cape San Lucas (at the south extremity of the California Peninsula) on the west. It was designated by the first Spanish navigators the Red or Vermillion sea (*Mar Rojo, Mar Vermejo*), on account of the colour of its water, and its resemblance to the Red sea. The learned Jesuit missionaries, who traversed it from end to end, called it *Seno Mar Lauretaneo*, which means gulf or sea of Loreto.*

The length of the gulf is about 700 miles; its greatest breadth is 180 miles at its entrance; but throughout its extent the distance from one side to the other varies from 60 to 120 miles. Beyond the thirty-first parallel, its breadth rapidly diminishes to the Rio Colorado, which falls into it at its head. The configuration of the Adriatic gives a very good idea of that of the Gulf of California.

It has been often remarked, that a singular phenomenon occurs here, which science does not explain, and of which we possess but few examples;—it is that of rain falling when the atmosphere is quite clear, and the sky perfectly serene. Humboldt and Capt. Beechey have related the fact; the first having testified as to its occurring inland, the second in the open sea.

The two coasts of the Gulf of California run almost parallel with each other toward the N.W.; they are for the most part low and full of salt marshes, tenanted by alligators, reptiles, and insects. The general aspect of the country is said to be naked and desolate. There is an entire want of water and vegetation; only mangroves, and some thorny plants, such as the *cactus*, *magueys* (aloes), or *acacias*, being visible. Orange trees or palms are rarely met with, and one must proceed some leagues into the country to find vegetable mould. The shore is formed by sand and lands quite unfit for cultivation.

In addition to a great number of fish, of various species, two kinds of immense shark are found in the gulf, which often seize the pearl fishers. Whales are also met with in considerable numbers, and on the islands are numerous seals and sea-calves, the furs of which are very thick. The pearl fishery is, or rather was, carried on in the gulf.

* There are apparently only two reasons why the gulf of California was called the Vermillion Sea; these are probably—1st, the colour imparted to the water during the rainy season by the rivers draining a ferruginous country, the river Colorado especially, and—2ndly, the beautiful purple colour which the waves take at sunset and sunrise. In the day time the waters are blue or green according as the clouds intercept or modify the solar rays, conjointly with the nature and depth of the bottom of the sea. It is also possible that the colour may be owing to banks at its surface, composed of myriads of graptacea somewhat similar to the prawns of the coasts of Europe.

At the entrance of the gulf, on the eastern side, may be seen in the distance, the summits of Sierra Madre; these separate the provinces of Jalisco, Sinaloa, and Sonora, and those of Nuevo Mexico, Chihuahua, and Durango. The coast of Lower California presents, without interruption, a series of rugged peaks of volcanic origin, and without any vegetation. This mountain chain, which comes down from the North, and extends throughout the whole peninsula, gradually decreases in elevation as it approaches cape San Lucas.

The eastern side of the Gulf of California, between latitudes 23° and 32°, consists of the coasts of the departments of Sinaloa and Sonora, which are divided by the river Fuerte. The population of these two provinces is about 800,000, of whom perhaps 60,000 are Indians. The climate is temperate, and the lands in the interior are fertile, but the principal sources of wealth are the mines of gold and silver; it is said that upwards of two hundred places have been explored and worked, and that these precious metals are met with everywhere. In these two departments are some considerable cities. The most important are in the province of Sinaloa, *Culiacan*, where reside the governor, bishop, and the préfet of the province &c., population about 10,000,—*Rosario*, having a population of possibly 8500, and where the general commanding the forces of Sinaloa and Sonora resides. In the province of Sonora is *Arizpe*, the capital until the year 1889, when in consequence of the incursions of the Apache Indians the seat of government was transferred to the ancient mission of San José de los Ures, 40 leagues to the southward,—population 7000. In this province the port of *Guaymas* concentrates all maritime commerce, but *Hermosillo* is the centre of its trade and riches. Besides these towns there are in these two provinces many large villages or pueblos.

In no part of the many miles of coast between Mazatlan and Guaymas is there a town. At a short distance from the beach there is a depth of 7 to 8 fathoms, and at 15 to 20 miles from it 44 to 55 fathoms. The principal rivers, sailing northward from the port of Mazatlan are the Piastra; the Elota; the Tavalá; the Culiacan, with a small port named Altata (the sea in front of this river is so shallow that large vessels ought to give the entrance an offing of 5 or 6 miles); the Tamasula; the Macapule; the Sinaloa,—to the north-westward of which is point San Ignacio, whence a reef extends seaward about 8 miles. North of point San Ignacio is the river Fuerte or Santa Maria de Ahome. It is said that at the river Fuerte, it is necessary when anchoring to get a mile north or south of the entrance to obtain a depth of 5 to 6½ fathoms. About 50 miles northward from Fuerte river is the mouth of the river Mayo which is almost closed by a bar. In the vicinity of Guaymas is the river Yaqui, the banks of which are inhabited by an Indian tribe of the same name.

Although none of the rivers, just mentioned, are navigable, their entrances will receive coasters, which bring merchandise from Mazatlan, Guaymas and sometimes even from San Blas. The goods are carried thence on the backs of mules to Culiacan, Villa Feliz de Tamasula, Sinaloa, Villa del Fuerte and Alamos.

Off the coast of Sonora northward from Guaymas there are some islands which bear the names of San Pedro Nolasco, San Pedro Martir, and in about lat. 29° that of Tiburon. The last mentioned island is inhabited by the Seri tribe of Indians, who have some huts on the main land; it is 10 leagues long, and is the only island in the

gulf which is inhabited. The channel eastward of the island, between it and the shore, is narrow and dangerous, and is fronted at its northern end by Patos island.

All this part of the province of Sonora is barren and inhabited only by some miserable Tepocas Indians. As far as the river Colorado the coast is for the most part very low and barren, and the wind continually raises from it clouds of very fine sand.

The Colorado river has its source in United States territory, in about lat. 40° ; its length is estimated to be about 1500 miles, of which about 600 miles is navigable for vessels of small draught.

When descending the western side of the gulf, from north to south, we pass the watering places of San Felipe, San Fermin, Santa Ysabel, La Visitacion, San Estanislao, the bay of San Luis de Gonzaga, San Juan y San Pablo, Los Remedios, the bay of Los Angeles, San Rafael, capes San Miguel and San Juan Bautista, the islet of San Barnabé, cape Trinidad, Santa Anna islet, and the cape of Las Virgenes, which is the last extinct volcano in Lower California, and which, according to the Jesuits, was still in activity in 1746. There is much sulphur in the neighbourhood of the crater of this volcano.

Upon the parallel of the volcano of cape Las Virgenes, at 5 and 8 leagues in the interior, are the missions of Santa Maria Magdalena and Nuestra Senora de Guadalupe.

In lat. 29° is the island of Angel de la Guardia which is long and narrow, and forms with the coast the Ballenas channel, where a great number of whales have been met with. Opposite the island, at 9 leagues from the shore, is the mission of San Francisco de Borja.

Opposite the island of San Marcos, in lat. $27^{\circ} 12'$, but at 6 leagues inland, there still exists the mission of San Ignacio. That of Santa Rosalia lies half a league from the sea on the banks of the river Mulege. Pearls are, or were, found here, and on the banks of the river fruits and grain are grown.

From Mulege bay to Loreto there is always, near the land, a depth of 20 to 30 fathoms, and the coast contains several good anchorages; the points met with are Concepcion, Santa Teresa, Pulpito, San Juan, Mereenarios, point Mangles, and San Bruno cove.

At 8 leagues northward of Loreto the little island of Coronados offers shelter from the north-eastward. Near the beach of the mission there is a depth of 4 fathoms, and under the lee of the island of Carmen 18 to 16 fathoms.

The mission of Real de Loreto, opposite Carmen island, was once the capital of Lower California, but in 1844 it had only about 200 inhabitants; it was then so much decayed that the authorities had transferred to the Real de San Antonio. The presidio, the mission, and the church, were in ruins. These buildings, very substantially built by the Jesuits, were intended to serve, in case of attack, as an asylum to the inhabitants. They are surrounded by a thick wall, which turns the waters of a torrent that descends from the mountains; and which several times washed away the houses and the vegetable earth. The presidio was defended by some small bronze artillery, which was never used. The church, for a long time after its decay, contained many pictures, silver vessels, and dedicated jewels of considerable value, which, though left quite exposed, were considered safe from spoliation.

At 15 leagues in the interior, westward of Loreto, are the missions of San José de Comandu and San Francisco Xavier.

Southward of Carmen island are the *Danzantes* islands, the *Pearl* banks, the *Galeras* islands, *Catalans*, (8 leagues in length), *Monserate*, &c. The only points visited by shipping are the harbours of La Paz and San José del Cabo.

La Paz (where Cortez landed, May 8rd, 1535, is in lat. 24° , long. 110° (approximate). It is the most commercial port of Lower California, and the seat of the territorial government. Vessels from San Blas, Mazatlan, and Guaymas, often come here to purchase shell at from 16 to 18 piastres the quintal, and mother-of-pearl shells at 9 piastres the hundred-weight.

At La Paz, the Rio Yaqui, and Guaymas, small vessels of 20 to 40 tons each, are, or were formerly, fitted out for the pearl fishing. The divers are all Yaqui Indians, who often descend to a depth of 10 or 12 fathoms. The fishing begins in May, and ends in October. The principal pearl banks in the gulf are in the bay of La Paz, near Loreto, the S.W. point of Carmen island, Puerto Escondido, Los Coronados, Los Danzantes, San Bruno, and San Marcos islands.

Winds.—The prevailing winds in the gulf of California, from November to May, are from the north-west, and from May to November, from the south-east.

During the season of the north-west winds the weather is always fine; though, toward the head of the gulf, during the months of December, January, and February, moderate gales from the north-west are frequently experienced.

During the rainy season, or from May to November, south-easterly gales may be expected at any time below Guaymas, and occasionally a local hurricane or cyclone, known as "El Cordonazo," blows with great violence. This latter is generally toward the end of the rainy season. After this the weather clears, the north-west wind sets in, and fine weather for six or seven months follows.

Currents and Tides.—The currents depend in a great measure upon the prevailing winds. Between Guaymas and San Blas they are strong and irregular during the rainy season.

Tides are felt throughout the Gulf of California; their height varies with the direction and force of the wind, and the configuration of the coasts: thus it is 7 feet at Mazatlan, the road of which is open; and at Guaymas, the port of which is strewn with islets, and sheltered from the wind, it does not exceed $5\frac{1}{2}$ feet.

In the upper part of the gulf, above Guaymas, the tides ebb and flow regularly, increasing in strength until the mouth of the Colorado is reached, where the ebb tide frequently flows at the rate of 5 or 6 knots per hour.

The Coast.—The coast between Mazatlan and Guaymas is low and dangerous and should only be approached with the greatest caution. During the rainy season the currents are strong and variable, particularly off the mouths of the small rivers and esteros.

About 8 miles N.N.W. from Pajaros island is Camaron point, a rocky bluff 60 feet high, with a hill 885 feet high about a mile inland. Thence the coast trends N.W. $\frac{1}{2}$ W.

26½ miles to Punta Piastla, a rocky headland, 110 feet high, with a reef extending off a short distance to the southward and westward. The coast between these two points is low and sandy, except at Grueza point; midway between them lies a rocky bluff surmounted by a hill 90 feet high. Nine miles to the northward and eastward of Grueza point is a double peak, 2120 feet high; 5 miles to the westward of which is a solitary table-peak 1220 feet high.

Piastla River, 8 miles northward of the point of the same name, is a mere creek until the rainy season converts it into a torrent. Vessels which come here for dye-wood anchor in 5 or 6 fathoms, half a mile from the beach and abreast a pier and some huts on the shore. The approximate geographical position of the entrance of the river is lat. $23^{\circ} 42' 20''$, long. $106^{\circ} 45'$.

Eloa River, 15 miles north-west of Punta Piastla, like the Piastla, is merely a creek in the dry season, but during the rains a turbid torrent. About 80 miles up the river is the village of Eloa. The approximate geographical position of the entrance of the river is lat. $23^{\circ} 54'$, long. $106^{\circ} 58'$.

Boca Tavala.—From Punta Piastla to Boca Tavala, or entrance to San Lorenzo river, the coast trends N.W. ¼ W. about 50 miles. The coast between them is low and sandy, but free from outlying shoals. About 15 to 20 miles inland is the Sierra de San Sebastian, from 1000 to 5000 feet high, and extending for 80 miles almost parallel with the coast. The approximate geographical position of Boca Tavala is lat. $24^{\circ} 15'$, long. $107^{\circ} 21' 30''$. The anchorage outside the entrance is in 6 or 7 fathoms water, 2 miles from the beach, with the round-topped peak of the distant range of mountains bearing N.E. by N. This peak is 4700 feet high, and distant 61 miles from the anchorage.

The San Lorenzo river in the dry season is only navigable for coasters drawing 5 feet. The distance from the mouth of the river to the village of Quila is 17 miles. Ships come here for dye-wood.

Culiacan River.—From Boca Tavala the trend of the coast is N.W. by W. ¼ W. 80 miles to the entrance of Altata estero and Culiacan river. All this coast is low and sandy, the low land extending many miles inland to moderately high ranges of mountains.

The channel into Culiacan river lies between heavy breakers which extend nearly 8 miles seaward of the entrance. The depth on the bar between these breakers varies, averaging $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms.

The anchorage off Altata estero is in 6 fathoms, $8\frac{1}{2}$ miles from the entrance, with the saddle of El Dorado (2621 feet high), in range with the distant Double peak (6897 feet high, 55 miles inland), bearing N. 48° E. This is, or was (1878), also the range for entering the estero, with $2\frac{1}{2}$ fathoms on the bar at low water. Small vessels find excellent anchorage, sheltered from every wind, off the village of Altata, inside the estero.

Schooners and vessels of 50 or 100 tons can enter the river at any time, provided they have sufficient wind in their favour to enable them to stem the tide, which has a strength occasionally of 4 to 5 knots. The ebb tide carries discoloured water several

miles to sea; this is often mistaken for shoal water. The soundings from seaward to the bar decrease very regularly; at the bar the depth decreases suddenly. The river above Altata is reported to be navigable for a distance of 10 or 12 miles, with an average depth of 5 fathoms.

Altata, the seaport of Culiacan, is a small village near the Culiacan river, which empties into the estero about $8\frac{1}{2}$ miles from the mouth of the latter.

The approximate geographical position of the village (assuming Creston island, Mazatlan, to be in long. $106^{\circ} 28'$) is lat. $24^{\circ} 36' 36''$, long. $107^{\circ} 53'$.

It is high water on the days of full and change of the moon at 11h. 30m.; spring tides rise about 6 feet.

Supplies.—There is but a poor supply of drinkable water, and provisions are scarce. Cattle can be procured from the rancho of Tule, at 6 miles from the landing place.

There is a good road from Altata and also from Salina to Culiacan; it runs along the river Culiacan which falls into the estero of Altata. On both banks are Indian villages, the inhabitants of which cultivate maize, beans, &c. The distance from Altata to Culiacan is 36 miles. Provisions and various means of conveyance can be obtained at Altata.

Culiacan is the capital of the province of Sinaloa. It was founded in 1584, thirteen years after the taking of Mexico by Cortez. In 1853 the town was pillaged, since then its importance has greatly diminished, so that it contains now (1867) only about 8000 inhabitants. If a time of tranquility were to return it would in all probability soon regain prosperity, its geographical position being excellent. Its commerce is chiefly in dye-woods, cotton, and maize.

The following instructions for Altata are very imperfect, and are added because they may be of use in the event of the services of some one having a knowledge of the locality not being obtainable;—a pilot should be got if possible.

Captain Horn of the Hamburg barque *Colima*, 1860, says :—"As it is difficult to recognise the locality of Altata, particularly in the dry season, a coaster with a dull craft, well acquainted with the coast, may possibly make a quicker passage than a stranger in a fast clipper. Leaving Manzanilla in the dry season, which is best done with the land breeze, it is advisable to make long tacks and carry as much canvas as possible to stem the current, not doubling cape Corrientes too closely, the current there being very strong. Having reached the parallel of 21° , stand in for the coast, and make the land in the vicinity of Piedra del Mar, in order to anchor, if it should fall calm, as it generally does at night. In the *Colima* (350 tons) we brought up with the small kedge ($2\frac{1}{2}$ cwt.) and a 5 inch warp. The depth of water between Tecapan river and Mazatlan, at about a mile from shore, varies from 9 to 12 fathoms; there are no known dangers but what are visible, the lead showing the distance from the land;—the vessel, beating to windward, should never leave anchoring ground, as the current runs southward at a rate of 30 to 40 miles in 24 hours, and it would in a calm, drift back a considerable distance.

On leaving Manzanilla in the rainy season, a passage to Altata is very easily made, carrying a fair wind all the way; but in the dry season when the N.W. wind is blowing, much difficulty is experienced, as strong winds and currents are against you at that

time. It is advisable to hug the Mexican coast, in order to anchor, in case it should fall calm, as it generally does at night;—by standing out of anchoring ground it is probable that the vessel will drift back in the calm, nearly as much distance as was gained when beating up. On the passage, sight will be obtained of the Sierra de San Sebastian. Having approached about lat. $24^{\circ} 39'$ or $24^{\circ} 40'$, long. $108^{\circ} 10'$, the saddle-shaped hill of Tamasula will bear N.N.E. $\frac{1}{2}$ E. and the vessel will then be W. by S. from the anchorage, distant 7 miles. Steer E. by N. and anchor as soon as in 8 fathoms water, muddy bottom. On steering for the anchorage of Altata, if the lat. of $24^{\circ} 35'$ be passed, take care not to approach the shore too much, as there are reefs stretching out several miles to the southward. It is by no means safe to anchor too near the shore. In case it should come on to blow it is requisite to slip anchor and stand out to sea until the weather moderates."

Captain Clémenceau of the Bordeaux vessel *Elizabeth*, 1858, says of this river,* "The anchorage of Altata is in lat. $24^{\circ} 42'$, and a little north of the entrance to the river Culiacan. When approaching it from seaward, the first land seen is the mountains of Agua-pepe, which are situated some miles in the interior of the country; these present four detached summits, and it is the most northern of them that has to be kept in view when running for the land,—it should be kept eastward of N.N.E. in order to avoid the banks southward of the anchorage, which are said by the coasters to extend 8 miles to seaward, but this distance there are reasons for believing is exaggerated.

As all this coast is excessively low, it would be impossible at night to see any part of the shore before striking on the banks just alluded to; hence the lead must be freely hove, especially if there be reason to suspect that the vessel is in their proximity. The soundings are an excellent guide, and it is recommended not to get into a less depth than 15 or 18 fathoms.

The coast at the anchorage trends S.E. and N.W. inclining a little to westward. At a little more to the north it forms a point known as point Baradeta, off which are some shoals which extend out a considerable distance, perhaps 5 or 6 miles. The anchorage of Altata is between these shoals and others situated 4 miles to the southward.

The fine season for visiting this coast commences in November and continues till June. During this time vessels are in complete security."

From the entrance of the estero of Altata the distance to Boca Playa Colorado is about 89 miles in a N.W. direction. All the intervening coast is low and dangerous, as shoals extend off a long distance, particularly off Tule estero, 10 miles above Altata, and as far to the northward and westward as Altamura point, 9 miles above Boca Tule, where shoal water ($4\frac{1}{2}$ fathoms) is found 8 miles from the land.

Playa Colorado.—The entrance to the estero of Playa Colorado lies between two lines of shoals on which the sea breaks even in moderate weather. The depth of water in the channel is usually only 9 feet, but during the rainy season there is said to be 12 feet water on the bar.

* *Annales Hydrographiques*, Vol. XIV., Page 309.

The anchorage is in 5 or 6 fathoms about 4 miles from the mouth of the estero, and at the head of the banks or shoals making off to the southward and westward.

To enter the estero make for the beach to the eastward of the entrance, to within half a mile of the shore, and then proceed parallel to the shore-line, passing between the two lines of breakers, and carrying from 9 to 12 feet at low water. The tides rise 6 feet.

The little town of Playa Colorado is 4 or 5 miles from the mouth of the estero, and contains about 200 inhabitants. Its approximate geographical position is lat. $25^{\circ} 15'$, long. $108^{\circ} 16'$. Large quantities of dye-wood are annually shipped from here.

The following observations on making Playa Colorado are by Captain Eisenmenger, 1869:—"Sailing for Playa Colorado from Mazatlan, I should recommend keeping the Mexican coast on board as far as Tavala mountain in about lat. 24° ; the coast thus far may be considered tolerably clear, but always keep the lead going when standing inshore to take advantage of land and sea breezes. Then stand across to the Lower California coast,—where you ought to be able to make the south end of Cerralbo island, but there is a strong current setting to the southward in mid-channel; then beat up till abreast the north end of Espiritu Santo island, and you will probably be able to fetch your port on the port tack. When in lat. $25^{\circ} 10'$ or $25^{\circ} 15'$,—or better still, having sighted the Farallone of St. Ignacio (a conspicuous white rock in lat. $25^{\circ} 26'$, long. $109^{\circ} 21'$), steer due East inland, always keeping the lead going, till in about 6 fathoms; if you are then too far to the northward, run in this depth and at this distance from the shore to the southward, till you see the breakers on the Altamira banks far out to sea in a S.S.E. and almost South direction from you; you may then anchor in 5 or 6 fathoms, with the entrance of Playa Colorado inlet bearing about N.E., and about 5 miles off the breakers on the bar.

There is a difficult bar before the entrance to this inlet; part of it is a dry sand bank, separated from the main land to the northward by a shallow channel, and on which the sea continually breaks. The entrance to the inlet is well to the southward of this sand bank—where you will find an opening in the breakers; having entered, the channel leads in smooth water in a northerly direction along the breakers on the bar, and the south bank which fronts Saliacca island (south of the entrance). When up with the above-mentioned dry sand bank, you may keep away and steer for the furthestmost point of land to the northward, where you will find yourself in a beautiful wide bay with 6 to 7 fathoms of water, protected from all winds. The bay would accommodate hundreds of ships. Coasting vessels always enter over the bar, on which there is about 18 feet at high water; rise and fall of the tide about 7 feet.

The bay extends some distance inland, and there is a channel inside Saliacca island and the main by which small coasters and boats are said to go to Altata.

The mainland fronting this bay is an extensive mangrove swamp, cut through by many riverlike inlets, which stretch a great way inland and then terminate suddenly where the country begins to rise. These inlets are called *esteros*; and the largest of them leads to two places whence the dye-woods come, Colorado and El Manglon. To find the mouth of this estero, after entering over the bar, follow the north shore of the bay as far as a high sandhill, which stands close to the shore; then steer across the bay, nearly midway, or rather nearer the north shore, just keeping the northernmost

bush on Saliacca island open; this will lead you (in a channel between two shallow sand banks) up to the mouth of the *estero*; follow the branch to the right; after passing some bends you will find another branch to the right, which you must not enter, but the next fork beyond branches off to the two places, and you are then within a short distance of either,—the branch to the right leading to Colorado, the one to the left to El Manglon. The right branch of the *estero* leading to Colorado is very crooked, with many little creeks and openings in it, and now you must follow your own judgment, keeping in general towards the left hand; from a boat's mast or a tree on shore, you can see the masts of the small coasters or lighters, or even the houses and piles of dye-wood at Colorado. The custom-house and port-captain's office are at La Bregha, about 12 miles from Playa Colorado, but rather nearer El Manglon.

Vessels from Mazatlan generally take a pilot at about \$60.

Boca Navachista is distant $25\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from the entrance to Playa Colorado. The anchorage outside the *estero* is in 6 fathoms, between 2 and 3 miles from the shore. The entrance is narrow and intricate, with 7 feet on the bar at low water. It has become so shallow that the town of Navachista is fast becoming depopulated, and its rival, Playa Colorado, increasing to a corresponding extent. (1874).

Seven miles to the northward and westward, in the lagoon, is a remarkable white rock, 75 feet high.

On the small sand-island of Vinorams, which lies between the islands of San Ignacio and Macapule, tolerable good fresh-water may be obtained by sinking wells. There are several cotton farms or ranchos on this island.

About 16 miles eastward of Boca Navachista is the mouth of the river Sinaloa, useless for navigation.

Topolobampo.—This harbour lies $22\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Boca Navachista. Its entrance is between two lines of breakers and is exceedingly narrow and intricate. The depth is (or was in 1874) $2\frac{1}{2}$ to 3 fathoms on the bar at low water, but as the shoals constantly shift no dependence can be placed on the same depth being maintained any length of time. Before entering this fine bay with a vessel drawing more than 12 feet, it would be necessary to sound and buoy the channel.

The approximate geographical position of the entrance to Topolobampo harbour is lat. $25^{\circ} 32'$, long. $109^{\circ} 7'$.

The Farallone of San Ignacio (hereafter described), a small barren rock, 10 miles S. by E. from San Ignacio point, and the highlands of Topolobampo and San Ignacio, are excellent landmarks for making the anchorage off the mouth of the harbour.

Inside the shoals there is excellent anchorage in 7 or 8 fathoms, sheltered from every wind.

Point San Ignacio, in about lat. $25^{\circ} 36'$, long. $109^{\circ} 20'$, is distant $11\frac{1}{2}$ miles W. $\frac{1}{2}$ N. from the entrance to Topolobampo harbour. The intervening coast forms an open bay known as the bay of San Ignacio. There is good anchorage in this bay in north-west winds, but to southerly winds it is entirely exposed. A dangerous shoal extends off the point 3 or 4 miles to the westward, also to the southward about a mile; close around this reef the soundings are 19 and 26 fathoms.

San Ignacio Farallone.—At about 10 miles S. by E. from San Ignacio point is a small rocky island (perhaps $1\frac{1}{2}$ miles long) of the same name, which rises to the height

of 465 feet, and is the resort of numerous seals, sea-lions and birds; its position is about lat. $25^{\circ} 26'$, long. $109^{\circ} 21'$, and its situation in the gulf makes it a prominent object to such vessels bound northward as may get too far over to the eastern shore.

From point San Ignacio the coast turns sharply to the northward and for about 20 miles consists of a low shore with extensive lagoons (or esteros) behind it.

Ahome River.—The entrance to Ahome, or Fuerte, river is in about lat. $25^{\circ} 55'$, long. $109^{\circ} 24'$. Shoal water extends a long distance off the mouth of this river, so that it is only navigable by small coasters. The village of Ahome is situated about 10 miles from the sea; from this village a road runs along the left bank of the river to Fuerte, a distance of about 80 miles. In the rainy season large quantities of dye-wood are floated down in rafts and flat-boats. The anchorage is off the entrance in $6\frac{1}{2}$ fathoms water.

About 11 miles N. by E. from the mouth of Ahome river is the entrance of Alamos river, which is only navigable for the smallest coasters. Four miles to the southward of this river is a remarkable hill, 406 feet high, known as Alligator hill. This hill serves, with mount Alamos, as an excellent landmark for finding Agiabampo.

Agia-ampo.—Agiabampo estero is distant about 40 miles to the northward of point San Ignacio. The southern or main entrance channel is narrow and intricate, being between shoals and sand bars, upon which the sea breaks. The least depth on the bar in this channel in 1866 was 6 to 12 feet, but it is subject to change. The depth immediately outside this channel is 4 to 6 fathoms. On the southern side of the entrance of the port is, or was, a cross standing on a sand-hill 75 feet high. To enter the estero bring this cross, or hill, to bear East, and steer directly for it until inside the northern shoal, then haul up and run parallel to the shore. (1874).

The town of Agiabampo is 9 miles from the cross. Dye-wood, silver-ore, and treasures are shipped from this port. The distance from the landing place of Agiabampo to Alamos is 45 miles, and to Fuerte 47 miles, along carriage roads.

The geographical position of the cross on the hill is considered to be lat. $26^{\circ} 16' 18''$, long. $109^{\circ} 15'$.

In 1860 there were two navigable channels in use; the northern channel, round the north-east extremity of the sand-bar fronting the port, then carried 6 feet water in fine weather.

Captain Townsend, R.N., who visited the harbour in 1866, says "Agiabampo is difficult to find as the coast is composed of one long line of low sand-hills covered with bushes; mount Alamos to the north, and Alligator hill to the south are the best guides to it. The best anchorage is in about 7 or 8 fathoms, with Alligator hill bearing S. $\frac{1}{2}$ W.; mount Alamos N. by E. $\frac{1}{2}$ E.; and the cross on the hill E. $\frac{1}{2}$ S. The soundings decrease very regularly until near the bar, when from $8\frac{1}{2}$ fathoms the water shoals suddenly to 9 feet. The best time for boats to enter is the morning, before or with the first of the sea breeze. Schooners of 50 to 100 tons go in and out with the sea and land winds. Treasure from Alamos is now shipped here; it is, consequently, much frequented."

Santa Barbara Bay.—From Agiabampo the coast trends northerly and then westerly to the entrance of Mayo river, a distance of about 25 miles; 10 miles farther westward

is a low reddish point, known as Punta Rosa, the western limit of Santa Barbara bay. The approximate geographical position of Punta Rosa is lat. $26^{\circ} 40'$, long. $109^{\circ} 38'$.

On the western side of Santa Barbara bay, and about a mile inside Punta Rosa, is an excellent anchorage in north-west winds, but entirely open to those from the south-east. The best anchorage is in 6 or 7 fathoms three-fourths of a mile from the shore, with the ruins of an Indian house on the beach bearing N.N.W.

The country in this vicinity is fertile and well watered, and quite thickly populated. About 8 miles from the mouth of the Mayo, and on its right bank, is the Indian town of Santa Cruz.

The Mayo, like all the rivers on this coast, is closed by a bar, leaving a narrow channel on the eastern side of 2 fathoms in the dry season. About 82 miles north-east from the mouth of the Mayo, is mount Alamos, 1980 feet high, an excellent landmark in navigating the coast.

Santa Barbara is the port of Alamos, which is distant 82 miles along a carriage road. Provisions are, or were, plentiful.

From Punta Rosa the coast trends W.N.W. $12\frac{1}{2}$ miles to Arboleda point and is fronted by shoal water to a considerable distance. A few miles inland of Arboleda point is a remarkable clump of trees, the only trees in this locality, and an excellent landmark.

Ciaris Island, separated from the main by a narrow estero of the same name, forms the coast-line to the northward of Arboleda point, as far as the entrance to the estero. It is a low island about 12 miles in extent and is distinguished from Lobos island, farther to the northward, by the absence of the palm-trees.

From the north-western end of Ciaris island to Lobos point, in about lat. $27^{\circ} 20'$, long. $110^{\circ} 35'$, the distance is 42 miles and direction W. by N. $\frac{1}{2}$ N. This coast is low and sandy, covered with bushes and cut up by lagoons, off the entrances to which shoal water extends from 1 to 2 miles. Lobos point is the south-west extreme of Lobos island; a dangerous shore makes off nearly 2 miles to the northward and westward of this point.

Lobos Island, about $4\frac{1}{2}$ miles in extent, is low and sandy, and is separated from the mainland by the narrow Estero de la Luna. The highest part of the island is a remarkable green mound, 75 feet high, about a mile south-eastward of Lobos point; it is known as Monte Verde. Between the hill and the point is a solitary palm-tree, by which the locality is recognised by the coasters.

About 46 miles E.N.E. from Lobos point, and to the south-eastward of Sierra Yaqui, is the small range of Baroyeen, the highest peak of which has an altitude of 8298 feet.

From Lobos point the coast trends northerly for about 82 miles to Cerro Yacicoris; it is very low, consisting merely of a narrow steep of sand, separating the sea from the numerous lagoons behind. Midway of the above distance is the mouth of the New Yaqui river. The entrance of the Yaqui is filled with shoals and sand-bars, and in the dry season is only navigable for the smallest coasters. All the country watered by the rivers Yaqui and Mayo is exclusively inhabited by Indians. Formerly the mouth of Yaqui river was just to the eastward of Cerro Yacicoris.

About 20 miles inland, and to the eastward of Cerro Yacicoris, is a range of moun-

tains known as the Sierra Yaqui, the highest peak of which, mount Bacatele, has an altitude of 8842 feet.

From Cerro Yacioris the coast, consisting of a smooth sand-beach, trends westerly about 18 miles to Morro Inglese, at the entrance of Guaymas harbour.

GUAYMAS, the most important harbour in the Gulf of California, is situated on the north-east side of a hilly peninsula, of which cape Haro, 5 miles South (*true*) from the town, is the extremity. Cape Haro, according to Capt. Kellett's observations, is in lat. $27^{\circ} 50' 30''$, long. $110^{\circ} 51' 40''$. The harbour is 3 miles in extent, is protected by several islands, and has a depth of 6 to 2 fathoms, the latter being immediately off the town. The population in 1874 was about 4000.

The outermost island, Pajaros, is 212 feet high, and connected on its northern side to a low sandy neck of land, the Playa de los Dolores, by a shallow flat of 15 feet; the proper passage into the harbour for large vessels is consequently westward of this island, between its south end and the coast, through a channel half a mile wide and about 6 fathoms deep. The island of Trinidad, to the westward of the entrance, is now known as San Vicente. When within, vessels are sheltered from all winds, and anchorage may be selected according to the ship's draught of water.

This port, although small, is one of the best on the coast of the Pacific. It is perfectly sheltered from all winds, and is sufficiently deep to accommodate frigates. Vessels of light draught can approach the mole, which is in a bad state, and if the water in front of this were dredged so as to increase the depth 9 or 10 feet, almost all commercial vessels could get to it. (1867).

Supplies.—Fresh-water is of indifferent quality and expensive; the same may be said of the wood. Excellent flour, fresh bread, and beef, may be obtained in any quantity and at moderate prices. No salt provisions or ship's stores can be purchased.

At present (1874) the Colorado River Steam Navigation Company has a small quantity of coal for steaming purposes deposited here.

Tides.—It is high water on the days of full and change of the moon at 8h. and the rise of tide is about 4 feet, but dependent upon the winds which sometimes increase it to 10 and 12 feet,

Some of the hills immediately over the town are lofty, of these mount Vigia, having an estimated height of 1585 feet, is considered to be the highest. Mount San Rafael over cape Haro is probably 1816 feet high.

The following notes on Guaymas are extracted from the work of M. Duflot de Mofras, 1844:—"The port of Guaymas may be recognised from the offing by a mountain surmounted by two peaks which are supposed to resemble the teats of a goat; hence the mountain is named by the Mexicans Las Tetas de Cabra. When this is distinguished, run along the coast, leaving it a little to port, and Pajaros island, on the east side of the entrance, will soon be seen; steer now so as to leave this island to starboard, and you will pass through the channel which it forms with the shore, and soon gain sight of the town and port of Guaymas. It is necessary to pass westward of Pajaros island because a bank runs from it northward to the shore. The entrance of the harbour once doubled, two islands are seen in the inner part of the bay, and the passage is between these to reach the anchorage, near or off the land, according to the vessel's draught of water. Vessels under 100 tons make fast to the landing place, and

those drawing 12 to 15 feet anchor a quarter of a mile off, in 8 or 4 fathoms. Large vessels should cast anchor outside these islands in 6 or 7 fathoms water. This harbour, which would hold a considerable number of vessels, is very safe in all seasons; the bottom is good holding ground, and it is sheltered from all winds, and forms a large basin, strewn with islands, which prevent any heavy swell from reaching it. The bank in front of the entrance is the only danger to shipping but it is easily avoided with leading winds, by keeping along the land. A vessel obliged to beat in, must be careful not to touch this shoal.

The town of Guaymas has usually about 5000 inhabitants during the fine season,—during the rainy season about 2000 return to the small towns in the interior. The port possesses neither fortifications nor garrison. There are numerous military and naval officers residing in this town, but as for the vessels of the latter they exist only on paper.

The low price and excellent quality of the flour at Guaymas offer considerable advantages to shipping requiring such. The merchants export the flour to Mazatlan, San Blas, Loreto, and La Paz. Bullocks are sold for about 12 piastres. Vegetables are very scarce and dear, and the water in the harbour is so bad that it is usual to send boats for it to the river Yaqui about 12 miles eastward of the port.

Guaymas is surrounded by high mountains, hence the heat is very great in the rainy season. The same fevers prevail here as at San Blas and Mazatlan."

Guaymas was visited in 1850 by Captain A. H. Wilcox, of the U.S. Transport *Invincible*, who anchored in 4½ fathoms; his remarks on the harbour are as follows:—
"The harbour is one of the best upon the coast; it is perfectly land-locked and protected by its numerous islands from every quarter. It has been so often and so well surveyed, that it is unnecessary for me to enter into a minute description of its merits. It is to be regretted, however, that it has not more water, from 4 to 5 fathoms being the average depth, which is insufficient for a ship of the line, or even a first class frigate. We found Guaymas a dirty place, with a dirty population of about 1500 or 2000. The houses being built of *adobe* with the roofs sloping towards the interior, have a very unfinished appearance, and from the harbour the town presents the appearance of having been abandoned when half built. There are two small piers in a ruined condition; and near the landing a large pile of earth, surmounted by two or three crumbling walls, over which floats from a lofty staff the flag of Mexico, marks the sight of the *adobe* fort knocked down by the guns of the *Dale* during the late war. There are several wealthy individuals in Guaymas, who monopolize the whole of the business with the interior of Sonora, but the mass of the population are in a state of wretched poverty. One or two small vessels from San Francisco were lying in the harbour, the proprietors of which had purchased everything in the shape of fresh provisions to be obtained. Sheep in large numbers they had purchased from the interior of Sonora with the intention of landing them at Molexo, on the California coast, thence driving them overland to San Francisco. Fowls, turkeys, ducks, goats, everything that could be purchased for one real and sold for twenty had disappeared, causing us no little difficulty in obtaining fresh provisions, even at comparatively high prices. The water at Guaymas is obtained from wells, and is slightly brackish. Excellent oysters are brought from the river Yaqui, which empties into the bay about 20 miles south of the town, and sold to the shipping at a dollar a bushel; the Mexicans, however, make no use of them.

The time of high water at full and change of the moon at Guaymas is not very accurately determined; it is, however, between 8 and 9 A.M. The ordinary rise of spring tides is 6 feet, neap tides 4 feet. The phenomena of four tides in 24 hours has repeatedly occurred here, as I am credibly informed. The prevailing winds in May, June and July, are from the South-east and South-west. The thermometer during the summer months ranges from 92° to 98° Fahr., the maximum 110°; during winter from 56° to 60°, minimum 45°. Guaymas is in lat. 27° 54', long. 110° 49' 10".*

Captain Henry Trollope, R.N. gives the following directions:—"Guaymas once having been seen cannot, with ordinary attention, be mistaken; the whole coast is so remarkable that one is only at a loss to say which is the most prominent landmark; nevertheless, as Pajaros island lies right before the entrance when 10 or 12 miles to the eastward, it is a blind harbour; a stranger without a chart might well be in doubt as to the entrance. Cape Haro, a bold bluff headland, jutting out due South to seaward, and rising with a wall-like cliff 200 feet from the water, is the best mark for the harbour; it has 14 or 15 fathoms touching the rocks, and the entrance between Trinidad (an island so called from the distinct manner in which it is formed in three divisions united at their base) and Pajaros is clear and free from danger, only taking care to give the points, particularly Punta Baja, a berth of half a cable; the lead is quite sufficient guide for going in. Secondly, the white smooth beach of Cochore, extending uninterruptedly from the Morro Inglese, at the entrance of the harbour, 12 miles to the eastward, and terminated suddenly by a still more remarkable hill, called Cerro Tordillo, or as we termed it, Morro Afulva, lies in such contradistinction to the extraordinary mass of hills forming the peninsula, out of which the harbour of Guaymas is hollowed like the crater of a volcano, that it is from the contrast almost equally remarkable. Further to the northward are the remarkable peaks called Tetas de Cabra (goat's teats). Some have recommended these to be made, as the prevalent wind is from N.W. and there is certainly no advantage to be gained by getting over on the Cochore shore, while by making the land to the windward of cape Haro a ship will have the prevalent breeze and current in her favour. The Tetas de Cabra are about 10 miles N.W. by W. of cape Haro; they stand on the west shore of a large deep bay, which has several patches of rocks and islets in it. Pajaros isle forms of itself an excellent harbour: in fact, the space between Trinidad, Pajaros, and Morro Inglese is equal as far as security, and superior as to depth of water, to the harbour itself; the advantage the latter has, is in there being a better access into the interior. The tides are very irregular, except at full and change; there appears to be only one tide in the twelve hours, but then the usual interval occurs between high and low water. The greatest rise and fall we observed during our stay, was 4 feet. High water 8h. a.m."

Ensenada de San Francisco.—Westward of cape Haro, distant about 4 miles, is cape Arco, 970 feet high; 8 miles beyond which is point San Antonio. The coast between the two latter points forms a bay which is known as the Ensenada de Francisco.

* This almost exactly agrees with the observations of M. Flaquet of the French corvette *La Danaide*, 1840, who places the island Almagrito, opposite the town, in lat. 27° 53' 50", long. 110° 49' 26."

There are several islets in this bay from 10 to 15 feet in height. On its east side is the anchorage of Bacoohibampo, sheltered from south-east winds. Here fresh-water, fresh beef, fruit, &c. may be obtained. About one mile northward of this anchorage is the cerro of the same name, 1450 feet high.

Two and a half miles to the eastward of point San Antonio is the entrance to Puerto de San Carlos, or Escondido. This small port is completely land-locked, and affords an excellent anchorage for small vessels, there being 8 and 4 fathoms water inside.

About one mile eastward of point San Antonio are the remarkable peaks, Las Tetas de Cabra, already alluded to. Two miles northward of point San Antonio is a group of small islands, known as the Algodones, the outer Venado island being about one mile from the shore.

San Pedro Point.—N.W. by W. $\frac{1}{2}$ W. $10\frac{1}{2}$ miles from point San Antonio is a bold rocky headland 515 feet high. To the southward of the point is a small open bay of the same name, in which a ship may find shelter in a north-west wind.

San Pedro Molasco is about 8 miles S.W. $\frac{1}{2}$ S. from San Pedro point. It is a barren rocky islet of volcanic origin, about 2 miles in length parallel with the coast, and 500 to 1000 feet in height. There is a sunken rock lying off its south-east end. It is inaccessible on every side. The approximate geographical position of its north-west extremity is lat. $27^{\circ} 59'$, long. $111^{\circ} 22'$.

From San Pedro point the coast trends N.W. $\frac{1}{2}$ W. about 16 miles to Morro Colorado; a remarkable headland of a reddish colour, 560 feet high. This part of the coast is high and barren throughout, affording neither shelter nor anchorage. Six miles S.E. $\frac{1}{2}$ E. from the latter point, is a white rock 60 feet high, distant about $1\frac{1}{2}$ miles from the shore. This and three others close in-shore are known as Las Piedras Blancas.

Northward of Morro Colorado distant $4\frac{1}{2}$ miles is the small estero of Tastiota, at the bottom of which fresh-water may be obtained.

San Pedro Martir.—This islet bears from Morro Colorado W. $\frac{1}{2}$ S. 49 miles, and from the south end of Tiburon island S. $\frac{3}{4}$ E., $22\frac{1}{2}$ miles. It is 1052 feet high and stands nearly in midchannel. The approximate geographical position of its centre is lat. $28^{\circ} 28'$, long. $112^{\circ} 17'$.

From the entrance of Tastiota estero the coast, which is low and sandy, trends westerly for about 14 miles and then north-westerly for 22 miles to Kino point. All this part of the coast is known as the San Juan Bautista flats.

Kino Bay.—Northward of Kino point is an open bay of the same name, in which small vessels can find shelter from north-west and south-east winds. At the bottom of this bay is the entrance to La Cruz lagoon.

Pelican Island.—About $2\frac{1}{2}$ miles N.N.W. from Kino point is a small island known as Pelican, lying close to the mainland; it is 540 feet in height. Its approximate geographical position is lat. $28^{\circ} 48' 30''$, long. $111^{\circ} 57'$.

TIBURON ISLAND.—The south-east end of Tiburon island bears W. by S. $\frac{3}{4}$ S. 10 miles from Pelican island. Tiburon is 20 miles long, S. by E. and N. by W., and $10\frac{1}{2}$ miles wide; it is high and rugged, its peaks varying in height from 1000 to 2500 feet. It is separated from the main land by a narrow intricate channel, known as El Infernillo, about 2 miles wide.

Off the north-west side of the island is a small ensenada, named Fresh Water bay. Here ships may find shelter from south-east winds.

Off the southern end of Tiburon island, about $1\frac{1}{2}$ miles distant, is a small barren island about one mile in length and 800 feet high, which is named Turner island. Between it and Tiburon is a small rocky islet, 150 feet high, leaving a clear channel 8 cables wide between the two last. A dangerous rock, awash at high water, lies 6 cables S.S.W. $\frac{1}{2}$ W. from this rocky islet.

Cape Tepopa, 8 miles N.N.W. $\frac{1}{2}$ W. from the northern end of Tiburon island, is a bold headland, 1857 feet high. It forms the north side of the entrance to El Infernillo channel.

Patos Island lies S. by W. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles from cape Tepopa. It is small and low except on the north-west side, where it rises in a conical hill to the height of 810 feet. It is nearly white from the deposits of guano and entirely barren. Its approximate geographical position is lat. $29^{\circ} 16' 30''$, long. $112^{\circ} 26' 30''$. There is a tolerable anchorage, in a north-west wind, on the southern side, in 5 fathoms, sandy bottom, a quarter of a mile from the beach. Spring tides rise 10 feet, neap 7 feet.

From cape Tepopa the coast trends N.W. $\frac{1}{2}$ N. 89 miles to cape Lobos; it is low and sandy, the coast-range rising to an elevation of 800 to 2800 feet a short distance inland.

Cape Lobos, off which are some sunken rocks, is the extremity of a rocky promontory the summit of which is 1180 feet in height. Immediately to the south-eastward of the cape is the anchorage of Libertad, where a vessel will be well sheltered from north-west winds. This anchorage is in 8 or 9 fathoms water about half a mile from the head of the bay. Spring tides rise about 12 feet, neaps 9 feet.

Cape Tepoca is 800 feet high and of a reddish colour. When first seen from northward it appears as an island. Another higher hill, of 540 feet, just to the northward of the cape, of a dark red colour on a yellow bed, is an excellent guide to the anchorage in Tepoca bay to the southward of the cape. The extreme western point of the bay is low and rocky, with a reef covered at high water, extending off a short distance to the southward. Good anchorage may be found inside this point, in 5 or 6 fathoms at low water, well sheltered in a north-west wind. Spring tides rise about 15 feet and neaps about 12 feet.

About 18 miles N.W. by N. from cape Tepoca is the entrance to San Ignacio river, in lat. $80^{\circ} 35'$. This river only breaks through the sand-bar at its mouth during the rainy season, but fresh-water may be obtained at all times just beyond the sand-hills. Thence to the north-westward the coast is of less elevation and consists, as far as Shoal point, of low sand-hills, and with the exception of some low stunted bushes, is entirely destitute of vegetation.

George Island, in lat. $81^{\circ} 0' 30''$, long. $113^{\circ} 14'$, is merely a barren rock, 206 feet high. Rocks extend about $1\frac{1}{2}$ miles to the northward and westward of the islet, some of which are above water and others awash at low water.

A tolerable anchorage in a south-east wind may be found on the northern side of the islet, off a small sand-bench covered at high water, which connects the islet with the nearest rock.

The coast northward of George island curves round in a westerly direction and forms an open bay, known as George bay, off the shores of which shoals extend a considerable distance, almost filling the bay. The whole coast thence southward, as far as cape Tepoca, is fronted by shoal water to the distance of $1\frac{1}{2}$ to 2 miles from the sandy beach.

Rocky Point, a low black point 24 miles N.W. $\frac{1}{2}$ W. from George island, forms the eastern limit of a small open bay of the same name. About 5 miles westward of the point is a headland 408 feet high, known as Rocky bluff, which forms the western limit of Rocky bay. Westward of this bluff is an extensive open bay, named Adair bay, which is so full of dangerous shoals as to be unnavigable by the smallest class of coasters.

Shoal Point, a low rocky point distant about 40 miles W. $\frac{1}{2}$ N. from Rocky point, is on the eastern side of the entrance to Colorado river.

Port Isabel.—Above Shoal point there is a channel, with 2 to 5 fathoms water in it at low water, as far as the slough of port Isabel, which is situated on the eastern side of the river's mouth. The only safe guide is the lead, as the flats and shoals are constantly shifting.

Tides.—The tide runs with great strength at the full and change of the moon, at times as much as 6 miles an hour. It is high water at port Isabel (F. & C.) at 2h. 30m., and an hour earlier at Shoal point. Spring tides in summer rise 32 feet, in winter 28 feet.

COLORADO RIVER.—This river, now in United States territory (except near the mouth), rises on the western slopes of the Sweetwater mountains and the Sierra de las Grullas, between latitudes 40° and 44° . It divides the State of California from the territory of Arizona. Its length from the upper sources of its tributaries is about 1500 miles,—the country in its vicinity being inhabited chiefly by Indians. It has but little depth, especially in the dry season; its banks, also, are so low that after heavy rains and the melting of the snow on the hills at its sources its waters overflow and inundate the flat country through which it passes. Its mouth, at the head of the gulf, is nearly 6 miles wide and divided into three channels by two small islands, named Montague and Gore islands. The main channel is eastward of the islands; it is narrow and dangerous and has only 5 or 6 feet water in it. Within the river are many banks dry at low tide. Near the mouth there is no vegetation, but higher up, the shores are thickly lined with rushes, willows, &c., and the interior country is clad with a coarse sharp grass.

At about 70 miles in direct distance from its entrance the Colorado receives the Rio Gila, which falls into it from the eastward, after it is increased in volume by the Rio de la Ascencion, formed again by the junction of the Rios Verde and Salado. All these rivers rise in the branches of the Sierra Madre, have but little depth, and during the rainy season overflow their banks. The country in their vicinity is very fertile, and furnishes abundant evidence of the existence of gold; it is inhabited by Yumas, Axuas, Cocomicopas, Apaches and other Indian tribes, in number about 20,000.

On the southern side of the junction of the Colorado and Gila rivers is Arizona city

and on the northern side is fort Yuma, the first station of the Colorado Steam Navigation Company. At this place the summers are intensely hot (rising to 126° Fahr. in the shade); but the winters are mild, the thermometer never registering below 84° Fahr.; there is scarcely any rain.

The Colorado is navigable for small steamers and barges drawing under 2 feet, as far as Colville, in lat. 36° 18', a distance of about 600 miles from the river's mouth. Throughout this extent it varies in width from a half to 1½ miles, and its depth averages 4 to 8 feet; there are no serious obstructions from rapids or other causes.

Above Colville the Colorado runs through a wonderful natural phenomenon, the Grand or Black Canon, a gorge 8 to 10 miles in length. Through this, it is said, the river flows with a deep current, and has an average width of 200 feet. The water is smooth and unbroken, and no rocks obstruct the passage. A large portion of the distance perpendicular walls rise to the height of 1000 feet on either side, in some places almost shutting out the light of day, and awaking in the mind of the voyager, the most profound admiration and awe. In solemn grandeur and native sublimity, it is said, no spot on earth equals the Black Canon of the Rio Colorado.

Tides.—At Shoal point, near the entrance of the Rio Colorado, the tides rise 25 to 30 feet at springs and 16 to 20 feet at neaps: high water full and change at 1h. 30m. The tidal currents are very strong, running 5 or 6 knots per hour, or even more. At about 40 miles from the river the tidal motion ceases entirely.

Captain Wilcox, U.S. Navy, 1850, gives the following description of Colorado river:—"We landed on the 25th, both on Montague island and the main, and found the soil clay detritus, and the vegetation scanty. The two islands situated in the mouth of the river, Montague and Gore, are low, flat and sandy. They are separated by a channel about one mile in width, and extremely shallow. They are evidently formed by the accumulation of the sand and detritus from the river, and are gradually increasing in size. We commenced the survey of the river upon the 25th, which we continued from day to day as we ascended. On the 27th, by taking advantage of the tide, we had succeeded in reaching Unwin point, off which we anchored. The log gave us at this point a current at ebb tide of 4½ miles per hour, which we found to be the average velocity, except at spring tides, when it is much increased.

On the 28th we left our anchorage at 7h. A.M., and beat up with the flood tide until about 9h., when we grounded off Charles point. The soundings had been from 1½ to 3½ fathoms. At this point we found the water devoid of any brackish taste, but extremely muddy, resembling in its character that of the Mississippi river. We continued daily up the river, sounding the channel at low water, and marking it by stakes, starting with the flood tide and floating with it until the ebb set in, when we anchored and went on shore to continue the survey. The shores of the river (here from 2 to 4 miles wide) continue of the same character, the grass growing somewhat more thickly as we ascended, however, and upon Greenhithe point, off which we anchored upon the 1st of January, we found a thick growth of *artemisia*. We had experienced no little difficulty in crossing from Charles point to Greenhithe point; the channel is extremely narrow, and nearly at right angles to the direction of the river, and we had twice been swept from it by the tide, and grounded upon the bank above. Upon the 1st, however,

we were favoured with a strong breeze, taking advantage of which we soon crossed and anchored in the channel upon the southern side. We landed upon Greenhithe point, (formed by two small indentations in the crumbling clayey bank,) and found the land on the south bank to be a perfectly level plain (the soil clay detritus), extending to the south and west for miles, and intersected by numerous sloughs, apparently filled by every spring tide. The river westward is bounded by the high hills of the Lower California chain, at the distance apparently of 15 or 20 miles. Trunks and limbs of large trees, some recently deposited, others in an advanced state of decay, are thickly scattered about, evidently left by the freshets. The river bank is abrupt, and about 20 feet in height; the water is gradually undermining it, and large pieces are continually dropping off, falling into the water with a sound as loud and not unlike the distant report of a musket. We discovered two new islands in the reach above Greenhithe point; they are low and sandy, separated by a small channel and covered with coarse grass; they have undoubtedly been formed within a few years. The bed of the river is filled with quicksand, and its current at the time of spring tides is so strong that the channel is continually changing. I named these islands Gull and Pelican respectively, from the numerous flocks of these birds continually hovering or afloat in their vicinity. We discovered the remains of a rude Indian hut near the shore, and observed many tracks of horses in the vicinity. During the night of the 1st the vessel grounding at ebb tide, swung around upon her heel, and thumping violently was carried by the tide (dragging her anchor) some 2 or 3 miles, grounding finally upon the shoal of Gull island; at flood tide sail was made on her as soon as she floated, and we succeeded in getting her back into the channel. As the vessel grounded at every ebb tide, and on the return of the water was violently swung around, thumping on her bottom, and swinging on her anchor, I began to see that it would be neither prudent, nor in fact possible, to ascend the river much higher, and we accordingly commenced making preparation for a boating expedition; the tides were now on the increase and on the 2nd I observed, with the log, the velocity of the current at ebb tide to be $5\frac{1}{2}$ miles per hour. We observed on the 2nd, for the first time, the singular phenomenon of the tide coming in, in a bore or wave, while the ebb was still rushing past the vessel towards the Gulf. On looking in the direction of Greenhithe point, a bank of water some 4 feet in height, extending clear across the river, was seen approaching us with considerable velocity; it moved steadily onward, occasionally breaking as it rushed over the shoals of Gull and Pelican islands; passing the vessel, which it swung around on its course, it continued up the river. This phenomenon was of daily occurrence until about the time of neap tides, and shows the truth of Hardy's assertion, that "*there is no such thing as slack-water in the river Colorado.*" I took the whale boat on the afternoon of the 2nd and proceeded up the river with the flood-tide; rounding Howard point, (so called by Hardy) we found ourselves in a broad but shallow bay about 4 miles in width. At the north-east and north-west extremities we found the two branches of the river, the former of which he mistook for the Gila; this is in fact the main channel of the river, the other being merely a slough which divides the river, about a mile from its entrance, into two branches, one of which terminates in a small lagoon about 4 miles from its mouth, the other communicating with the river

above. As there is not water enough in either of these branches to float a whale boat at low tide, it is evident that the river must have altered entirely since Lient. Hardy's visit, or that he never ascended it as he says he did with the *Brija*, a schooner of 25 tons. We sounded right across the bay and found a depth of $2\frac{1}{2}$ to 7 feet. As the schooner was drawing 8 feet, this settled the question as to her navigating the Colorado above this point."

After some interesting remarks upon the Indians who inhabit the country bordering on the river, Captain Wilcox continues "The bar at the mouth of the Colorado is about 10, possibly 15 miles in width; the soundings upon it are from 10 feet to 4 fathoms; it is a very loose, muddy bottom, and with a stiff breeze a vessel could force her way over it, even if drawing a foot or more than the lead would indicate. The distance from the junction of the Gila and Colorado to the mouth of the latter, by water, is about 104 miles, owing to the many bends of the river, though the difference of latitude is but little more than half that distance.

The navigation of the gulf of California presents none of those difficulties which we had been led to anticipate. The wind we found invariably from the north-west, which, at this season of the year, is its prevailing direction; it is only during the months of June, July, and August that the gales from the south-east are prevalent; except in Whale channel we noticed none of the strong currents so frequently mentioned as existing in the Gulf.

It would be difficult to mistake the entrance to the Colorado, it being in fact the head of the gulf, which gradually narrows from 40 to 8 miles when it is joined by the river, whose turbid stream discolours the gulf for many miles to the southward, in soundings of 12 and 14 fathoms. On the Sonora coast, however, exists an indentation some 15 or 20 miles in depth, called by Hardy, Adair bay; the shoals of this can be seen from the mast-head, a view from which would prevent one falling into the error which we did of supposing it a mouth of the Colorado. The angle at the junction of the slough and the main river is called Arnold point, and from the mouth of the river (after crossing the bar) to this point, the channel varies in depth from 15 to 30 feet, at ordinary high tide, and may, as we have practically demonstrated, be ascended by a vessel having a draught of 8 or 9 feet, by taking advantage of the flood, which has a velocity of from 3 to 5 miles per hour. It is impossible to sail up, however, for although the river varies in width from 8 miles to 600 yards, the channel is narrow and the navigation elsewhere obstructed by the numerous sand bars. The proper method, after passing Gore and Montagne islands through the western channel of the river, is that which we adopted, to drift with the flood tide, keeping close to the highest bank, sounding continually, and anchoring before the time of high water; in this way we progressed slowly but steadily, making, perhaps, 4 or 5 miles per day, until we arrived at the point where we finally landed the stores, and which I have named Invincible point.

Above Arnold point the river is very circuitous, the swell of the tide rapidly decreases, the channel becomes narrow, and the water has less depth. At this season, therefore, Arnold point may be considered the head of navigation for vessels of 9 feet draught; above this point we found always from 8 to 15 feet of water in the channel, whose

width varied from 50 to 800 yards; and as the river at that time was at its lowest stage, I have no hesitation in saying that it may be navigated at any season of the year by a steam-boat of 18 to 20 feet beam, drawing 2½ to 3 feet of water. A small stern-wheel boat, with a powerful engine and thick bottom, I would respectfully suggest to be a proper description of vessel for this navigation, where a strong current has to be contended with, and the channel (somewhat obstructed by small snags and sawyers,) is quite narrow in several places. At the present season (January, February, and March,) supplies from vessels arriving from the Gulf may be landed near Arnold point, upon the eastern bank, and a road being made from the post (a work of little difficulty over a level sandy plain) they might be transported by waggons across in three days. It would be preferable, however, to establish a depôt by anchoring a hulk near Charles point, laden with stores, from which a small steam-boat could carry more to the post in 24 hours than a hundred waggons could transport in a week. Either of these methods would be far preferable to the present slow, laborious and uncertain mode of supplying by waggons and pack mules across the desert from San Diego.

The time of high water at full and change at Arnold point is 8h. 20m. P.M., and the rise of ordinary spring tides about 12 feet; but during the season of freshets the river throughout its extent (judging from the statement of the Indians and the indications upon the banks) is at least 15 feet higher than at the time of our visit, and the velocity of the current which, above the effect of the tide, was from 1 to 3 miles an hour, is nearly doubled; the action of the tide ceases about 40 miles from the mouth; the banks of the river are low, flat, and either sandy or of crumbling clay which appears to have been deposited in successive strata. Near the mouth there is no vegetation, but higher up the shores are thickly lined with cane, rushes, small willows, acacia and cotton wood, and the country in the interior covered with a coarse sharp grass. Inevincible point is in lat. 31° 50' 26", long. 114° 46' 48".

The large shoal south of the point is an island, except at spring tides, and is gradually increasing in size and height."*

WESTERN SIDE OF THE GULF.—The coast on the western side of the entrance of Colorado river as far as point San Felipe, in about lat. 31° 24', consists of low plains rising gradually towards a range of mountains, 1500 to 2000 feet high, several miles inland. Mud flats and shoals extend nearly to the Sonora shore, having a narrow channel, with 2 to 5 fathoms water, between the flats and the mainland. Southward of point San Felipe, which rises to a height of 500 feet, is the small bay of the same name, in which some shelter can be found in a north-west wind.

W. by S. & S. from point Felipe is the mountain of Calamahué, 9180 feet high,

* San Francisco merchants are much interested to secure the trade of the Upper Colorado, which opens a navigable route to Colville, 420 miles from Salt Lake, and is fast acquiring commercial importance. Two different companies, each owning three steamers are engaged in a brisk business. Cargo for the Colorado river is delivered from San Francisco at fort Isabel; at the head of the Gulf of California, where it is taken up by the small steamers and carried to its different points of destination.

Between Colville and Salt Lake is a good waggon road, along which there are no less than forty-two thriving towns and villages. *New York Journal of Commerce*, April 24th, 1867.

said to be the highest in Lower California. It is nearly white on the top and jagged in appearance.

Consag Rock bears N.E. by E. from point San Felipe, distant 19 miles. It is small, 286 feet high and nearly white, and is sometimes called Ship rock from its resemblance to a ship under sail. There are several rocks extending nearly half a mile from it in a south-westerly direction.

The coast from point San Felipe to abreast the island of San Luis, in lat. $29^{\circ} 58'$, trends about S.S.E. $\frac{1}{2}$ E., and is low and sandy the whole distance, the coast-range rising to a height of several hundred feet a few miles in the interior. The water is shoal, there being from 12 to 15 fathoms 5 or 6 miles from the shore.

San Luis Island, distant about $2\frac{1}{2}$ miles from the coast, which is here low and sandy, is of volcanic origin. Its highest peak is 720 feet. A sand spit extends nearly a mile from the southern end of the island, leaving a safe passage of a mile and a half between it and the mainland. Good anchorage for either of the prevailing winds may be found here; on the southern side of the sand-spit for a north-west wind, and on the northern side for a south-east wind.

About 2 cables from the northern end of San Luis, and connected with it by a reef covered at high water, is the high rocky islet of Cantada. There are several rocks covered at high water in this vicinity. To the north-westward of these are three small islets, 800 to 600 feet high, lying parallel to the coast and distant from it about 3 or 4 miles.

San Luis Gonzales Bay, to the southward of San Luis island, affords good anchorage during south-east winds but is open to northerly winds. Its eastern limit is formed by Final point, from which San Luis island bears N.W. distant 12 miles.

From point Final to point Remedios, in about lat. $29^{\circ} 15'$, the trend of the coast is S.E. by E. $\frac{1}{2}$ E. and the distance about 46 miles. All this part of the coast is high, rocky, and precipitous, affording no shelter or anchorage the entire distance. Remedios point is low and sandy, with the high coast range a short distance back.

ANGEL DE LA GUARDIA.—Off this part of the coast is the great island of Angeles, or Angel de la Guardia. It extends 40 miles parallel with the coast, and is high, rocky, and perfectly barren. The whole western side is inaccessible and without anchorage; but on the eastern side there are several open bays where anchorage may be found in north-west winds. Off its northern end are several small islands, the largest of which is known as Mejia island.

The channel between Angeles island and the mainland is known as Ballenas, or Whale channel. The tide sets through here at times with great force. A current of at least 3 knots per hour has been experienced.

Puerto Refugio.—Between Angeles and Mejia islands is a fine harbour called Puerto Refugio, in which vessels may anchor, sheltered from every wind. About $1\frac{1}{2}$ miles south-westward of the entrance to this harbour is a remarkable white rock 197 feet high, known as the Sail rock. To enter the harbour from the westward it is necessary to pass to the northward of Sail rock, as there are several dangerous rocks, covered and awash at high water, bearing N.E. by E., distant rather more than a mile from Sail rock, and $\frac{1}{2}$ cables from the shore. There are also rocks lying off the southern extremity of Mejia island, about a cable from the cliffs.

The approximate geographical position of the south-east point of Mejia island is lat. $29^{\circ} 38' 7''$, long. $118^{\circ} 32'.$ *

Remedios Bay, southward of Remedios point, affords shelter during north-west winds. The best anchorage is in 10 fathoms a third of a mile from the beach, off a red hill 200 feet high.

Angeles Bay, 22 miles S.E. from Remedios point, is about 6 miles wide at the entrance and 4 to 5 miles deep. It is fronted by no less than fifteen islets, the largest of which, Smith island, is nearly 4 miles in length and one mile in width. This island is high, flat-topped, its greatest altitude being 1550 feet.

To enter Angeles bay from northward, follow the coast, passing between it and Smith island, keeping about a mile from the shore, until the spring is opened, to the southward of the sand-spit mentioned below.

To enter the bay from southward, it is better to follow the coast, passing in between the first island and the mainland.

On the western side of the bay is a small cove formed by a sand-spit extending to southward and eastward. Here excellent anchorage may be found, in 7 or 8 fathoms water, sheltered from all winds. Spring tides rise about 12 feet in this bay.

Fresh-water may be obtained from the springs near the anchorage. These springs are at the foot of a high round-topped mountain, 3420 feet in height, and are marked by reeds and bushes in their vicinity.

Las Animas Bay, the next bay to the south-eastward, is about 6 miles deep, and affords good anchorage for either of the prevailing winds. Its entrance lies between two headlands, the eastern of which is known as cape Las Animas.

Three miles southward of this last-named cape are two dangerous rocks known as Barnabé rocks. They are rather more than half a mile from the shore, and have but 2 feet on them at low water. There is a tolerable anchorage southward of the reef which unites them to the shore.

San Rafael Bay.—From cape Las Animas the coast trends southerly about 20 miles and then curves to the eastward, forming the open bay of San Rafael. The eastern termination of this bay is point San Francisquito, which is low and rocky.

San Gabriel Point, about 4 miles eastward of point Francisquito, is low, with high volcanic hills just behind it. It is distant 30 miles S.E. $\frac{1}{2}$ E. from cape Las Animas.

Immediately to the westward of San Gabriel point is the fine bay of San Francisquito, in which a vessel may find shelter from either north-west or south-east winds.

Islands of San Lorenzo, Esteban, &c.—Off the part of the coast just described lie the islands of San Lorenzo, Sal-si-puedes, Isla Raza, and Isla Partida. The passage between these islands and the mainland is known as the Sal-si-puedes channel.

San Lorenzo, the southernmost and largest of these islands, extends 12 miles W.N.W. and E.S.E. It is between $1\frac{1}{2}$ and $3\frac{1}{2}$ miles in width, and, like most of the other islands of the gulf, is high and barren. It is of volcanic origin, and is entirely destitute

* A plan of Puerto Refugio is published on the Admiralty chart No. 2248, edition 1879, to which we refer our readers.

of vegetation. The highest peak, near the southern end of the island, has an elevation of 1592 feet. About $2\frac{1}{2}$ miles from its northern end is a narrow boat-passageway through the island.

A mile northward of San Lorenzo is the small island of *Sal-si-puedes*, about $1\frac{1}{2}$ miles long, W.N.W. and E.S.E., and not more than half a mile across in its widest part. The highest peak is 876 feet. There are several detached rocks near the island.

There is a tolerable anchorage under the northern end of San Lorenzo, in a south-east wind.

Isla Raza is about 100 feet in greatest height. It lies 5 miles N. by W. $\frac{1}{2}$ W. from *Sal-si-puedes*, and is nearly white from the deposit of guano on it. There is a small white rock about $1\frac{1}{2}$ miles north-westward of the island, and another awash between the two.

Five miles north-westward of *Isla Raza* is a small island known as *Isla Partida*, from the fact that at a distance it has the appearance of being two islands. It is about $1\frac{1}{2}$ miles long, nearly north and south, and is formed of two peaks about 400 feet high, joined by a low and narrow strip of land. Two miles northward of this island is a rock about 175 feet high, with a reef making off to the northward and eastward about a mile, and ending in a rock 2 feet above water at low tide.

About 10 miles E.N.E.-ward of San Lorenzo island is the island of *San Esteban*, about $4\frac{1}{2}$ miles long and 3 miles wide. It is from 800 to 1700 feet high, and is rocky and barren. There are two tolerable anchorages off its southern end on either side of a low sand-spit.

San Pedro Martir island, already mentioned on page 137, lies E. $\frac{1}{2}$ N. 80 miles from San Gabriel point. It is a barren triangular rock less than 2 miles in extent, the highest part having an altitude of 1052 feet. There are three small islets off its southern end, the smallest being half a mile distant.

The coast from San Gabriel point to cape San Miguel, in lat. $28^{\circ} 12'$, a distance of $14\frac{1}{2}$ miles, is generally low, being formed of low bluffs and sand-benches, the coast range being a short distance inland. A mile to the southward of San Gabriel point is the small open bay known as Santa Teresa bay, where excellent anchorage in north-west winds may be found in 7 or 8 fathoms a third of a mile from the beach.

Cape San Miguel is a bold rocky bluff, 175 feet high, with several outlying rocks a short distance eastward of it. Southward of this cape is an excellent anchorage in north-westerly winds, in 7 or 8 fathoms, half a mile from the small sand-beach, a mile inside the cape.

Trinidad Point, about 21 miles S. by E. $\frac{1}{2}$ E. from cape San Miguel, is a moderately high bluff, with a hill 137 feet high just behind it. Close to the northward of this point is the open bay of San Carlos, on the northern side of which is San Carlos point. This latter point is low, with a small open bay northward of it, known as San Juan Bautista bay.

Cape Virgenes, 200 feet high, is distant about 27 miles S.E. by E. $\frac{1}{2}$ E. from Trinidad point. The intervening coast is low, the mountain-range being several miles in the interior. About 11 miles westward from cape Virgenes is Santa Anna point, beyond which is an open bay of the same name, where shelter may be found in a south-

east wind. A small fresh-water creek empties into the sea here; it may be recognised by the grass and trees on its banks.

From 12 to 14 miles inland are the three remarkable mountains known as Las Tres Virgenes, the highest having an altitude of 6547 feet. Between the Virgenes and the coast is Santa Maria mountain, 4802 feet high.

From cape Virgenes the coast trends south-easterly to abreast San Marcos island and then curves to the eastward, terminating in point Chivato, in lat. $27^{\circ} 5'$.

San Marcos Island lies $2\frac{1}{2}$ to 4 miles off this part of the coast, its centre being in about lat. $27^{\circ} 18'$, long. $112^{\circ} 2'$. It is about 5 miles long, nearly parallel with the coast, and is from 1 to $2\frac{1}{2}$ miles wide. The highest peak has an altitude of 891 feet. Lobos rock, 20 feet high, lies half a mile off the south end of the island, and a reef, with one fathom water on it, extends a mile farther to the southward, leaving a clear and safe channel of 5 and 6 fathoms, about a mile wide, between the island and the mainland. Rocks above water extend about a mile northward from the north end of the island.

There is excellent anchorage for small vessels under the south end of San Marcos island. Fresh-water may be obtained. An excellent quality of gypsum is found here in large quantities.

In the vicinity of San Marcos island is a pearl fishery which in former times was fished with considerable success. Opposite the island, or in the vicinity of cape San Marcos (which cape is in latitude about $27^{\circ} 28'$), and at the distance of two leagues from the coast, are what remains of the mission of San Ignacio, established in the year 1725.

San Lucas Cove.—The entrance to San Lucas cove lies nearly 6 miles W. by S. from the northern end of San Marcos island. It affords excellent anchorage in all winds for vessels drawing 7 or 8 feet.

Tortuga Island.—About 14 miles N.E. by N. from the north end of San Marcos island, is the highest peak of Tortuga. This island is about 2 miles long, east and west, and its highest peak is 1216 feet.

Santa Agueda Point lies N.W. by W. $\frac{1}{2}$ W. 8 miles from the north end of San Marcos island. It is low, with a small rock 10 feet above water, lying half a mile northward of it. Santa Maria cove is distant about $10\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from this point.

There are several cañons along the coast, known as Providencia, Purgatorio, Soledad, and Santa Rosalia, and extensive copper-mines at each one a few miles from the coast. Santa Maria cove affords shelter in north-west winds, but is open to the south-easters.

Purgatorio.—This port is in lat. $27^{\circ} 28'$, and is distant about 20 miles S.W. by W. from Tortuga island. It is an open roadstead, and in winter, which is the best season to visit it, vessels anchor in about 6 fathoms water, bottom of coarse sand. There are no inhabitants, the port being simply a depot for the copper ore which is extracted in great abundance from the copper mines already alluded to. Water is the only commodity obtainable here, but it is necessary to search for it about 6 miles in the interior.

Santa Inez Point, 2 miles southward of Chivato point, is like the latter low and sandy. About 2 miles distant from it is the largest of a small group called the Santa Inez islands. These islands extend about 2 miles, nearly north and south. They are surrounded by shoals and sunken rocks, leaving a narrow but safe passage between them and Santa Inez point, where a ship may anchor and find shelter in north-west winds. Southward of this group of islands is the bay of Santa Inez.

MULEGE or CONCEPCION BAY.—The entrance to this extensive bay, in about lat. $26^{\circ} 53'$, long. $111^{\circ} 50'$, is between Gallita and Concepcion points, and is rather less than 2 miles in width; it faces the north. In nearly midway of the entrance points are some rocks with deep water close to them; on account of which care is required when running in. The bay extends south-east about 22 miles and varies in width from 2 to 6 miles. There are numerous small islands scattered over its surface, and several small harbours where vessels may anchor sheltered from every wind.

Near the bottom of the bay, on the west side, is a remarkable well of fresh-water, which rises and falls with the tide.

Mulege.—The anchorage off Mulege is about 10 miles southward from Santa Inez point, and a little to the northward of Sombrerito rock; it is in 9 or 10 fathoms, half a mile from the beach. Sombrerito rock, which is 119 feet high, is at the northern entrance of the small Rio Santa Rosalia, on the banks of which, 2 miles from the sea, is the village of Mulege. Behind Sombrerito a short distance is a high hill of a reddish colour, known as Colorado mountain, 896 feet high.

The entrance to the river is narrow and shallow, with several rocks in the channel covered at high water. There are never more than 9 feet at the mouth at high water. The tide rises 5 feet.

In standing in for the anchorage off Mulege, do not bring Sombrerito to the westward of S.W., as there is much foul ground between that rock and Gallita point.

Mulege contains from 800 to 1000 inhabitants. Wood, water, and excellent fresh beef may be obtained at all times, and several varieties of vegetables and fruits in their season. There are several fine gardens on the banks of the river, and a great deal of enterprise is shown by the inhabitants.

In reference to Santa Rosalia de Mulege, Lieutenant Hardy R.N., 1826, says:—“Being abreast Sombrerito, with the wind easterly, we bore up, and stood directly for the coast, with our head about a quarter of a point to the southward of that hill, in order to avoid a reef of rocks that runs off from it for some distance. When within 150 yards from the shore, Sombrerito then bearing off us N.N.W., and being in-shore of the reef, we hauled up, and stood for the centre of the hill, till within 85 yards of it, when we dropped our anchor, and ran out warps to the shore on both sides of us, to prevent the vessel from either drifting or swinging, for which there is no room.

The water on the bar is so shallow, that we touched twice in going over it; but as it was composed of only soft sand, the vessel received no injury, although it blew fresh from the eastward, with a heavy swell on the shore. In the situation where we ultimately moored, there are 3 fathoms close by the hill, and it is well sheltered from wind and sea.

There is a small rivulet here, extending above the mission, which is at the distance of 2 leagues from the coast. From the sea, the hill of Sombrerito hides all appearance of the ravine; but from the shore, the date, olive, and peach-trees, as well as plantations of vines and maize, present a cheerful show of verdure by no means common in Lower California. About the distance of a league from the mouth of the rivulet, the water is fresh, and I took advantage of it to refill our empty casks.*

The mission of Santa Rosalia de Mulege was established in the year 1700 by the Marquis de Villa Puente, as it is supposed, and its distance from Loreto is about 45 leagues. It produces wine, spirits, and soap, which are exported chiefly from the capital; besides grapes, dates, figs, and olives, all of good quality. These form the principal branches of its commerce.

About 6 or 8 leagues from Mulege, at some distance from the shore side, is the mission of La Madalena, established about the same period as the former; but by whom is not known. Its productions are the same as those of Mulege; but the quality of the spirits which are made from the mezcal, growing wild about the mountains in its neighbourhood, is said to be the best of any made in Lower California. Its population is about equal to that of Loreto.

From Concepcion point to Santa Teresa point the trend of the coast is about S.E. by E. 20 miles. The latter point is low and rocky, with many outlying rocks in its vicinity. Thence to Pulpito point the coast trends south-easterly for 12 miles and forms a large open bay, known as San Nicolas bay. The land about this bay is low, the coast range being farther inland than to the southward. Abreast this bay and distant 6 miles N. by W. from Pulpito point is the small island of *Ildefonso*, 387 feet high, a mere barren rock.

Pulpito Point, so called from its imagined resemblance to a pulpit, is a bold headland 470 feet high, and when first seen from the southward appears like an island, the land connecting with the coast-range being low. To the southward of this point is an excellent anchorage, in 5 or 6 fathoms, half a mile from the beach, where a ship is well sheltered from north-west winds.

Mangle Point, about 15 miles S.S.E. $\frac{1}{2}$ E. from Pulpito point, is a moderately high bluff, with cliffs of variegated colour, 200 to 300 feet high, to the northward. Between these two headlands are several bays, the largest of which is San Basilio, a few miles to

* It appears from the following that Lieut. Hardy experienced some difficulty in leaving the harbour of the mission of Mulege "Not having been successful in my search for divers, I determined to proceed to sea. The wind was still dead upon the shore; and as it was not possible to attempt taking the vessel out through the channel, without her being inevitably driven on to the beach, I sent the boat ahead with a rope, and we succeeded in towing the *Briga* through the midst of the rocks, which were perfectly distinguishable at intervals by the heave and fall of the waves, which enabled us to avoid them. Having got fairly outside of them, we clapped on sail, shaped our course along shore, and in two hours time went through the passage formed on the left by the low point of Santa Ines, and on the right by the island named after the same saint, carrying 4 and 5 fathoms water. Having doubled the point, we came to anchor on the south-west side of the island of San Marcos, round which I had been given to understand pearls had been formerly fished. We found, however, only a few unproductive shells. On this island there are numbers of wild goats, and I sent the captain and a part of the crew to hunt them."

This part of the Gulf of California is so rarely visited that it is but little known.

the southward of Pulpito point, and between it and Basilio point. About $3\frac{1}{2}$ miles northward of Mangle point is Mercenarios point, a rocky cliff of dark sandstone, surmounted by a red cone, 519 feet high. Above this latter point the coast recedes, forming, with Basilio point, a small open bay known as San Juanico cove. There are several rocks above and under water in this bay, and it should be used with great caution. San Basilio point is a low rocky cliff, about 50 feet high, formed of red sandstone.

To the southward of Mangle point is a good anchorage in a north-west wind. The only dangers to be apprehended are some low rocks, 2 feet above high water, at about 2 miles south-east from the point. In standing in for this anchorage, it is better to pass close to the point, where is plenty of water and no hidden danger.

Coronados Island, the centre of which bears S.E. $\frac{3}{4}$ S., distant 10 miles, from Mangle point, is of small extent, rising to an altitude of 928 feet. A low sand-spit extends off some distance from its south-west side, leaving but a narrow channel between the island and the mainland. It is only safe for small vessels. Northward of this sand-spit is an excellent anchorage in a south-easter.

The shore between Mangle point and Coronados island is bold, and immediately behind it the land is 1500 to 2000 feet high.

Loreto.—This is a small village situated in about lat. 26° ; it is distant 5 or 6 miles southward from Coronados island.

Above Loreto the coast sweeps to the northward and eastward $3\frac{1}{2}$ miles to the low sandy point of Terra Firma. In this bay there is an excellent anchorage sheltered from every wind except from the northward and eastward. In good weather the best anchorage is off Loreto, in 8 or 9 fathoms, half a mile from the beach. In standing in from the N.E. bring the church and Sugar Loaf peak in range, and anchor as directed above.

Loreto contains about 150 inhabitants. There are two or three fine gardens, where oranges, figs, dates, &c., and in their season, vegetables, are raised. Fresh beef, wood and water may be obtained at all seasons. (1874).

In former days Loreto was a place of considerable trade, but this was many years ago; it is now in a state of decay. It was founded in the year 1698 by Don Juan Caballero y Osis, who wrote a long account of it, and considered its locality as one of great importance, and subsequently it became the capital of Lower California. The anchorage is open to winds from North, N.E. and S.E., and when these prevail with any strength, so heavy a sea is sent in, that it is rendered by no means safe for a vessel not well found in ground tackle. Carmen island affords shelter from eastward, and the mainland from westward. The following description of Loreto was written in 1826 by Lieutenant Hardy, R.N. :—

“Loreto stands in a valley of about 2000 or 3000 feet wide, surrounded by wild and sterile mountains, of which that called La Giganta is the highest and least picturesque.³ There are two gardens in the place in which the vine, peach, fig, quince and date

³ This mountain is estimated to be 5794 feet high. It is of volcanic origin, as is all the rest of the chain which runs through the Californian peninsula.

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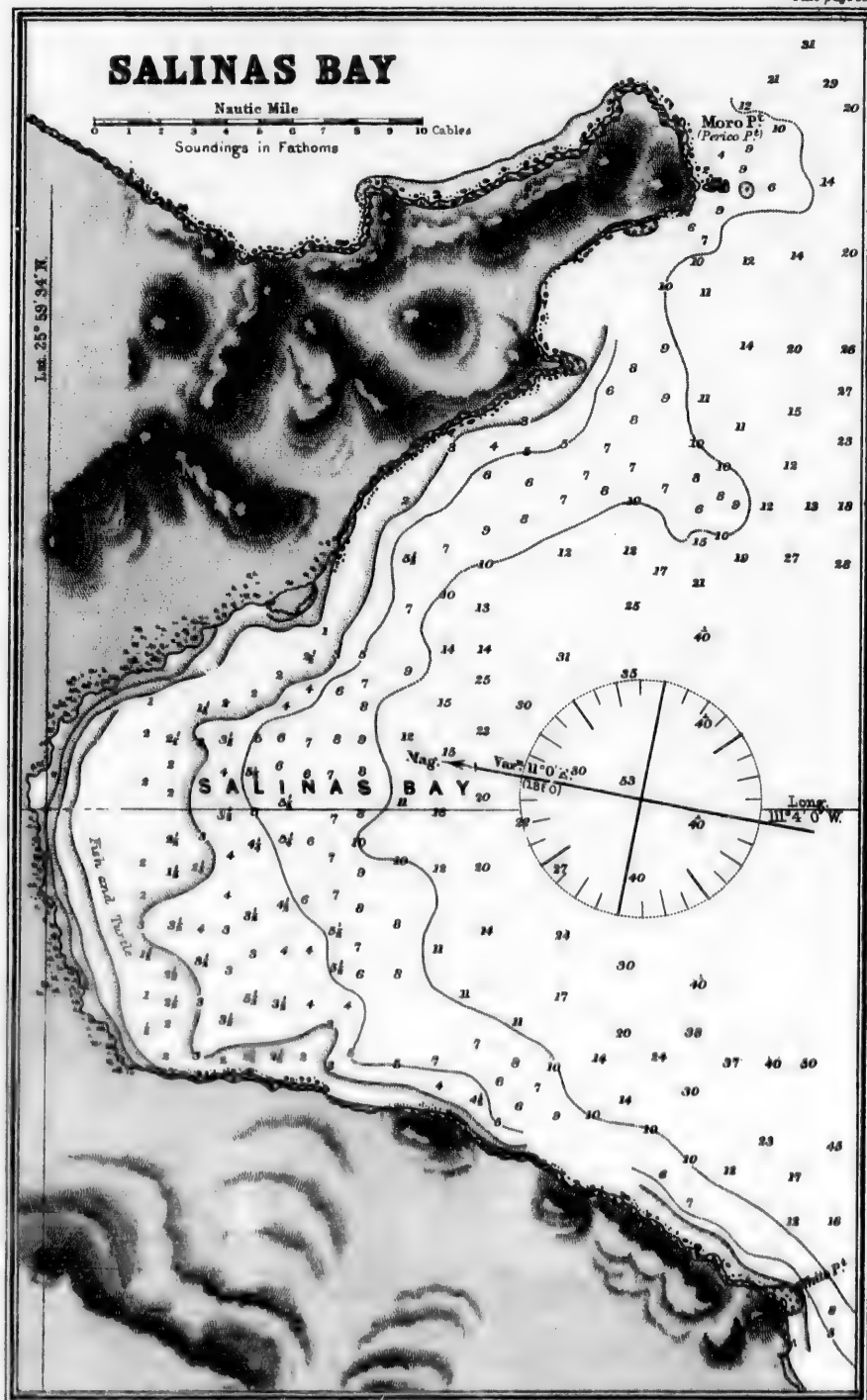
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are cultivated. A considerable quantity of wine is annually made, notwithstanding the fruit is common property to all the inhabitants. Peaches and pears are dried as well as figs; the dates are preserved; and these fruits are afterwards exchanged for wheat and Indian corn, brought to the mission in small schooners from the port of Guaymas.

The hills which surround the town are chiefly composed of primitive rock, granite, and hard sand-stone, all intermingled, with scarcely any appearance of soil upon them. They are thus capable of absorbing but little moisture; and during the heavy rains, which happily do not occur more frequently than once in 5 or 6 years, the rush of water through every part of the town, as it comes down the ravine, is so great, that instances have been known of some of the houses having been actually carried away. Although the natives are perfectly sensible of their perilous situation in consequence of these floods, the love of their dwellings is so great as to extinguish all fear for the future, and all desire to change their residence.

The inhabitants of Loreto are of a dingy, opaque, olive-green, which shows that there is no friendly mixture in the blood of the Spaniard and the Indian; or it may be that by degrees they are returning to the colour of the aborigines. They appear to be, the same squalid, flabby, mixed race, which is observed in almost every part of the Mexican coasts."

Punta Coyote, about 11 miles southward from Loreto village, forms the eastern side of a small bay, known as Puerto Escondido, a perfectly secure harbour for small vessels in all weathers. Just above Punta Coyote is another small bay, named Chuenque.

From Punta Coyote the coast trends easterly and forms an open bay in which there are many rocks above and under water. Off the easternmost point of this bay several detached rocks lie to the northward and westward. Eastward of this bay is a prominent point, off which are several detached rocks lying to the northward and westward; three of these, 70 to 80 feet high, and pinnacle-shaped, are known as Los Candeleros.

CARMEN ISLAND.—About 4 miles eastward of Punta Coyote is the southern extremity of Carmen island, situated in about lat. $25^{\circ} 47' 30''$. This island is 16 miles in length N.N.E. and S.S.W., and its breadth gradually increases until it becomes $5\frac{1}{2}$ miles wide near its northern end. It is of volcanic origin and has a range of peaks its entire length, from 400 to 1500 feet high. Its shores are steep, there being a depth of 7 to 10 fathoms at a very moderate offing, which increases to 40 fathoms at about a mile from the cliffs.

Salinas Bay, on the eastern side of Carmen island, near its northern end, is a fine harbour, in which protection may be obtained in all winds except those from the south-east. The best anchorage is in 5 or 6 fathoms, one mile south of the white house with a cupola, at the head of the bay. A salt-mine is situated at the head and about half a mile from the beach. The geographical position of the head of this bay, according to the Admiralty chart No. 2248 (1879), is lat. $25^{\circ} 59' 34''$, long. $111^{\circ} 4'$. More point, known also as Punta de Perico from its supposed resemblance to a parrot's beak, forms the eastern limit of the bay; it is a sharp, rocky cliff, surmounted by a peak of reddish colour, 460 feet high; close to the point is a round detached rock, southward of which, distant one cable, lies a dangerous sunken rock.

Lobos point, the northern extreme of Carmen island, is a moderately high rocky point surrounded by detached rocks.

Between Lobos and Tintorera points is a small open bay known as Puerto de la Lancha, in which protection may be obtained from southerly winds.

A small low sand islet, named Cholla, lies off the north-western end of Carmen island and near to it. Southward of this islet is a small bay known as Puerto Ballandra.

Danzante Island.—About midway between the south end of Carmen island and the mainland is the island of Danzante. It is $8\frac{1}{2}$ miles long, nearly parallel with the coast; in form it is slightly crescent-shaped, very narrow, and 100 to 450 feet in height. There is a clear passage nearly a mile wide between it and Carmen island.

San Marcial Point, a moderately high rocky cliff, surmounted by a peak 500 feet high, is distant about 25 miles S.E. $\frac{1}{2}$ E. from Punta Coyote. The intervening coast is of the same general character as that to the southward, rising rapidly from the sea to a height of 1000 to 2000 feet.

San Marcial rock lies about one mile N. by E. from San Marcial point, and is surrounded by reefs and shoals; it is of small extent and 25 feet high. There is a boat-passage between it and the point.

Three miles westward of San Marcial point is the small bay of Agua Verde. There is good anchorage here in ordinary weather, and fresh-water may be obtained from the rancho near the beach. Distant $8\frac{1}{2}$ miles above this is San Cosme point, a rocky cliff about 225 feet high.

The small rocks San Cosme and San Damien, the former 75 feet high and the latter 45 feet, lie about a mile to the northward of San Cosme point. About $7\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from San Cosme point is a small white rock, 80 feet high, lying about 8 miles from the mainland.

Southward of San Marcial point is the small bay of San Marte, where a vessel may find anchorage in good weather. There are 10 to 12 fathoms water within a third of a mile from the small sand-beach at the bottom of the bay. A dangerous reef extends off about a mile south-east of the point, on which the sea breaks in nearly all weathers.

Santa Catalina Island.—The south end of Santa Catalina island bears N.E. by E. $\frac{1}{2}$ E. about 15 miles from San Marcial point. It is between 7 and 8 miles long, north and south, and from 600 to 1500 feet high. The approximate geographical position of its north extremity is lat. $25^{\circ} 42'$, long. $110^{\circ} 44'$.

Montserrate Island.—The south end of Montserrate island bears N. by W. $\frac{1}{2}$ W. 8 miles from point San Marcial, and about the same distance from the mainland. It is about 4 miles long, parallel with the coast, and 1 or 2 miles wide. It is 200 to 700 feet high and presents a more inviting appearance than Santa Catalina. It is, however, like all the other islands hereabout, of volcanic origin and perfectly barren. Three miles north of the island are two low rocky islets, known as Las Galeras, northward of which is a dangerous rock only one foot above high water.

From San Marcial point the coast trends S.E. $\frac{1}{2}$ S. 33 miles to Nopolo point, abreast which, distant $2\frac{1}{2}$ miles, is the northern extremity of San Josef island. About midway between the above points, in lat. $25^{\circ} 16\frac{1}{4}'$ ($? 14'$), is an isolated rock, 55 feet high, about a mile off the shore, known as Black rock. Other rocks lie off the coast to the southward of the Black rock; one of these, the Habana, 90 feet high, is situated in lat. $25^{\circ} 7'$.

Nopolo Point is a rocky cliff with a rugged peak 1650 feet high immediately behind

it. From this point to San Everisto point, a distance of $6\frac{1}{2}$ miles S.E. $\frac{1}{4}$ E., the land is high and precipitous.

About 2 miles southward of San Everisto point, a low sandy point makes out, southward of which is good anchorage in 5 or 6 fathoms, half a mile from the beach.

Mechudo Head, 12 miles S.E. by S. from San Everisto point, is a bold perpendicular cliff of variegated colour, about 200 feet high, surmounted by a dome-shaped hill 750 feet in height. Behind this hill, and a short distance inland, is mount Mechudo 3000 feet in height, and the highest land in this vicinity.

SAN JOSEF ISLAND.—The south end of San Josef island bears N.E. $\frac{1}{4}$ E. about 6 miles from Mechudo head. It extends nearly 18 miles nearly parallel with the coast, N.W. $\frac{1}{4}$ W. and S.E. $\frac{1}{4}$ E., and is from 2 to 6 miles wide, the northern end being narrowest and terminating in a narrow, sharp point. It is rather higher than Espiritu Santo, several of its peaks having an altitude of over 2000 feet, and is of volcanic origin. It is separated from the mainland by a deep channel 3 to 5 miles wide, except abreast of Nopolo point, where it is $2\frac{1}{2}$ miles in width. Here, a low sand spit makes off from the island toward Nopolo point.

Amortajada Bay.—There is a good anchorage in Amortajada bay, on the south-west side of San Josef island, in 7 or 8 fathoms, where a ship is sheltered from every wind, particularly the dreaded "cordonazos" or south-easterly gales. In the centre of the bay, about $1\frac{1}{2}$ miles off the entrance of San Jose river, is an islet, named Caijo, with a dangerous reef extending off its northern extremity about a quarter of a mile. Fresh-water may be obtained here. The position of the north-west point of the bay is lat. $24^{\circ} 54' 80''$, long. $110^{\circ} 35' 40''$. (See the Admiralty Chart No. 2248, edition 1879),

San Francisco Island.—Several rocks and islets lie off the south-western end of San Josef island, the largest of which, San Francisco, lies nearly 2 miles south of it. This is 600 feet high, nearly 2 miles long, and about one mile wide. The passage between it and San Josef is dangerous, as it contains many rocks above and under water.

There are two dangerous rocks, about 5 feet high, known as Seal rocks, lying off San Francisco islet, about $8\frac{1}{2}$ miles from the mainland, with the following bearings;—north-western end of San Francisco, East nearly 2 miles; Salinas point, N.W. by N. $5\frac{1}{2}$ miles.

In using the channel between San Josef island and the mainland at night or in thick weather it is better to keep the mainland close aboard, as there are no known dangers on that side.

Las Animas.—About 9 miles E. by N. $\frac{1}{4}$ N. from the north end of San Josef island are the rocky islets of Las Animas, about 90 feet in height. There is a deep passage between them and San Josef.

San Diego Island lies N. $\frac{1}{4}$ W. $5\frac{1}{2}$ miles from the north end of San Josef. It is nearly a mile long, N.E. and S.W., and its highest point is 722 feet. A reef makes off about a mile from its south-western point, ending in a small rock awash. There is another reef $1\frac{1}{2}$ miles south of the highest peak, with from 4 to 5 fathoms on it. A reef also makes off about half a mile from the northern end of San Josef, leaving a clear passage, about 3 miles wide, between that island and San Diego; but it should be used with caution, as there may be other rocks in it which the surveyors were unable to find.

Santa Cruz Island lies $4\frac{1}{2}$ miles N. by W. from San Diego island. It is about

3 miles long north and south, and about 2 miles wide. It is 1500 feet high, and extremely barren and rocky.

ESPIRITU SANTO ISLAND, about 20 miles S.E. by S. from the south end of San Josef island, lies in the entrance to the bay of La Paz, and is separated from the mainland by San Lorenzo channel, which is $3\frac{1}{2}$ miles wide. The island is 9 miles long, N.N.W. and S.S.E., and from 2 to 4 miles wide. It is of volcanic origin, and from 200 to 1200 feet high. A remarkable red cone, 197 feet high, near the south-western end (Dispensa point) of the island, is an excellent land-mark in navigating San Lorenzo channel.

The approximate geographical position of Lupona point, the southernmost point of Espiritu Santo, according to the Admiralty Chart No. 2248, edition 1879, is lat. $24^{\circ} 24' 18''$, long. $110^{\circ} 17'$.

Several detached rocks and islets lie off the western side of Espiritu Santo island, the largest of which, Ballena (or Gallo), is about a mile northward of Ballena bay. There are also two or three off the northern end of the island, known as Los Islotes.

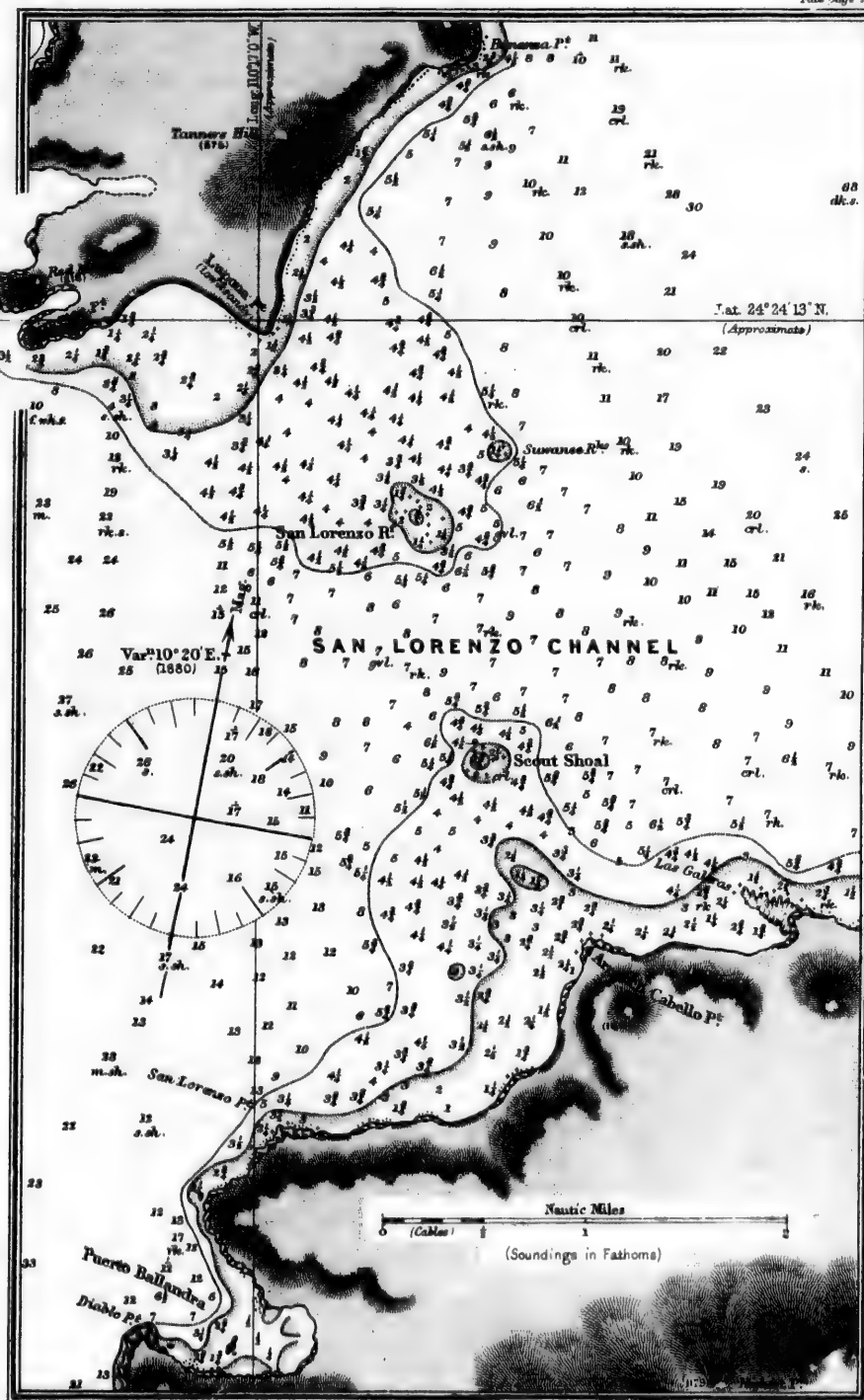
At the south-west end of Espiritu Santo island there is a little bay named San Gabriel, in which vessels may anchor in about 10 fathoms, and obtain shelter from northerly and easterly winds, but they must not go far in because the depth suddenly decreases to $3\frac{1}{2}$ and 2 fathoms, whence to the shore it is very shallow. In the middle of this shallow part there is a ledge of rocks, which extends out 4 cables from the beach. The western limit of the bay is known as Prieta point.

At about a mile northward of Gabriel bay, and on the same side (the west) of Espiritu Santo island, is an anchorage in what is known as port Ballena. It consists of an open bay fronted by two small islets, named Gallo and Gallina, of which the first mentioned is the largest and most northward. The anchorage is at about midway between the islets in $5\frac{1}{2}$ to 6 fathoms, and shelter is afforded against easterly winds.

San Lorenzo Channel.—The channel south-westward of Espiritu Santo island, between it and San Lorenzo point, is $3\frac{1}{2}$ miles wide and has a depth of 5 to 8 fathoms, the depth of 5 fathoms being on a bar which connects the island to the shore. Upon this bar is a reef of 12 feet (in some few spots less than 7 feet) water, situated in nearly mid-channel, but nearer the island than the shore, known as San Lorenzo reef. About half a mile north-east of the latter are the Suwanee rocks with 9 feet water over them.

Shoals also extend off the southern shore of the channel, the outermost of these was discovered by the officers of H.M.S. *Scout* in 1868. This rocky patch has a depth of 9 to 12 feet water over it, is distant nearly $1\frac{1}{2}$ miles from the south-east shore of the channel, and discoloured water was observed to extend some distance northward from it although a depth of not less than $6\frac{1}{2}$ fathoms was obtained. From it, the centre of a gap next southward of the highest peaks of Cerulbo island bore E. by S.: the eastern extreme of Espiritu Santo N. $\frac{1}{2}$ E.; North rock (breakers N. $\frac{1}{2}$ E.; and the highest land on the California shore just open north-eastward of the redmound on Dispensa point, the southern end of Espiritu Santo. These bearings place it N.W. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles from Arranco Cabella point, N. by E. $\frac{1}{2}$ E. $2\frac{1}{2}$ miles from San Lorenzo point. Scout shoal is guarded by a buoy on its northern edge.

This channel should be used with great caution, as other dangers may exist, its hydrography being but imperfectly known. It is high water on the days of full and change of the moon at 8h. 30m.; springs rise 6 feet.



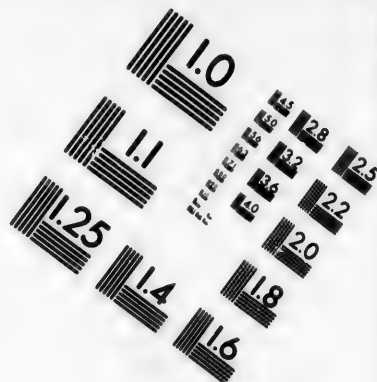
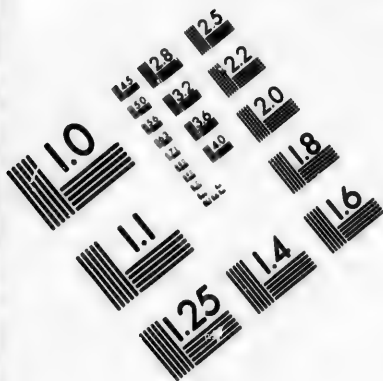
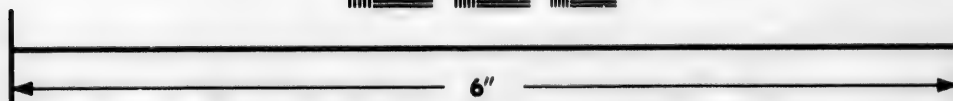
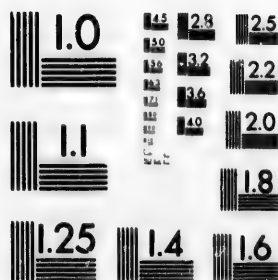


IMAGE EVALUATION TEST TARGET (MT-3)



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Directions.—To enter the channel from the southward and eastward, steer W.N.W. $\frac{1}{4}$ W. for the red mound on Espiritu Santo island, giving Coyoté point a berth of half a mile. When Lobos point bears N. by W. and San Lorenzo point S.W. by S. steer W. by S. until you open Lobos rocks beyond Diablo point; then the red mound will bear N.W. $\frac{1}{4}$ W. and you will be clear of all dangers.

There is another channel with 4 fathoms water near Espiritu Santo island, between it and San Lorenzo reef.

Arranco Cabello point is low and sandy, sloping back gradually to mountains 1000 feet high. San Lorenzo and Diablo points are moderately high bluffs.

LA PAZ BAY.—The bay of La Paz, the largest on the eastern side of Lower California, is nearly 40 miles deep and 16 to 20 miles wide. The western side, from Mechudo head to the bottom of the bay, presents a bold shore with precipitous cliffs or high mountain-slopes, affording no anchorage or shelter for ships; thence 16 miles to El Mogote point, the coast is low and sandy, with shoal water making off one or two miles. At about 5 miles within the bay on its east side is the harbour of Pichilingue; and farther on, near its head, is the harbour of La Paz.* A pilot's assistance should be obtained to enter either of these harbours.

Pichilingue Harbour.—The entrance to Pichilingue harbour lies about 4 miles south of Diablo point. Colorado point, to the southward of the entrance, is low and of a red colour.

Pichilingue harbour, though small, is one of the best on the coast. It is formed by the island of San Juan Nepomezeino, which is about $1\frac{1}{4}$ miles in extent N. by W. and S. by E. and about a quarter of a mile broad. The island is distant from the shore only about a third of a mile, but in this space there is a depth of $4\frac{1}{2}$ to 7 fathoms on mud and sand; hence it forms an excellent harbour, where shelter may be obtained completely from all winds. The entrance is from southward, because the north end of the island is connected to the shore by a shallow flat of less than 10 feet at low water; in this entrance the depth gradually decreases from 10 to 6 fathoms. Old writers speak of the excellent pearl beds to be found in this harbour. The south end of San Juan Nepomezeino, according to the Admiralty Chart, No. 2248, edition 1879, is in lat. $24^{\circ} 15' 35''$, long. $110^{\circ} 17'$.

La Paz Harbour.—Prieta point, the entrance to La Paz harbour, lies S.E. by S. 2 miles from Colorado point. It is a sharp perpendicular bluff, about 50 feet high, the land sloping back gradually from it. La Paz is situated about 8 miles southward of Prieta point.

The harbour of La Paz is formed by a projecting point of low marshy land, known as *El Mogote*, from which a shoal of only 3 to 4 feet water, extends about $2\frac{1}{2}$ miles in a north-easterly direction, or nearly to Prieta point, the north point of the harbour; the channel in is, consequently, close under that point. A ship drawing 16 or 17 feet may enter at any state of the tide, but should take a pilot, as the channel is narrow and tortuous. The bar has upon it a depth at $2\frac{1}{2}$ fathoms at low water, and immediately outside it are soundings of 5, 6 and 7 fathoms at the same period of tide. The harbour

* Lieutenant S. Osborn, R.N. has observed that a vessel anxious to keep on the coast of Mexico, or its neighbourhood, during the bad season, cannot do better than run over to the bay of La Paz; he speaks of it as a splendid harbour.

consists of a narrow channel of $8\frac{1}{2}$ to 4 and $8\frac{1}{2}$ fathoms, between the shoal just referred to and the eastern shore, and vessels at anchor off the town are sheltered by the shoal from seas sent in by north-westerly winds. The best anchorage is half a mile to the southward of the wharf in $8\frac{1}{2}$ fathoms water. The depth in the channel-way opposite the town is $8\frac{1}{2}$ to $4\frac{1}{2}$ fathoms. The geographical position of La Paz, according to Com. Dewey, U.S.N., 1874, is lat. $24^{\circ} 10' 9''$, long. $110^{\circ} 19' 58''$.

The harbour is protected on its western side, as already observed, by a low marshy peninsula called *El Mogote*. There is a boat passage to the bay near Mogote.

La Paz is the seat of the territorial government of Lower California, and contains about 2000 inhabitants. The climate is said to be healthy.

Supplies of various kinds, such as fresh beef, bread, wood, and water may be obtained in small quantities, but they are very dear.

Coyote Point, the south point of the entrance to San Lorenzo channel, is moderately low, with a small out-lying white rock a few feet from it. About 16 miles S.E. by E. $\frac{1}{2}$ E. from this point is Gorda point, a bold rocky bluff with high land behind it. Between these points the coast is bold and rocky, with occasional sand-beaches, the country at the back being broken and mountainous. In some parts sunken rocks lie close off the shore.

Ventana Bay.—From point Gorda to point Arena de la Ventana, a distance of 12 miles E.S.E., the coast recedes, forming the large open bay of Cerralbo, about 5 miles deep in its deepest part; it is called by the natives Ventana. To the southward of the bay lies an extensive plain covered with cacti and stunted bushes. On the north-western side of the bay, the high coast-hills rise abruptly from the water's edge. Anchorage may be had in any part of the bay near the coast.

Ventana, a small settlement, lies about 9 miles to the westward of a low sandy point named Arena de la Ventana, and at the bottom of the bay. Fresh-water, cattle, hogs, poultry, &c. may be procured here.

CERRALBO ISLAND, of volcanic origin, high and barren, lies off this part of the coast. Its highest peak has an altitude of about 2500 feet. The island extends about 14 miles N.W. and S.E., and its greatest width is about 4 miles.

The geographical position of the northern extremity of Cerralbo island, according to Com. Dewey, U.S.N., 1874, is lat. $24^{\circ} 21' 35''$, long. $109^{\circ} 58' 3''$.

There is a fine channel between this island and the mainland, 5 miles wide at point Arena de la Ventana, and $6\frac{1}{2}$ miles at point Gorda. It is apparently free from all dangers.

Anchorage may be had on the south-west side of the island to the northward of a sand point. The tides set through this channel with considerable force, at times 2 knots per hour.

There is a small dangerous rock (named Seal rock), about 12 feet high, $5\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from the northern end of Cerralbo island; and a sunken rock, known as Montana, lies about 100 yards south of its south-east extremity, with only 12 feet water on it.

Point Fortec, about 8 miles south-eastward from point Arena, is bold and rocky; the coast between these points is low and sandy, broken frequently by rocky patches 10 to 20 feet high.

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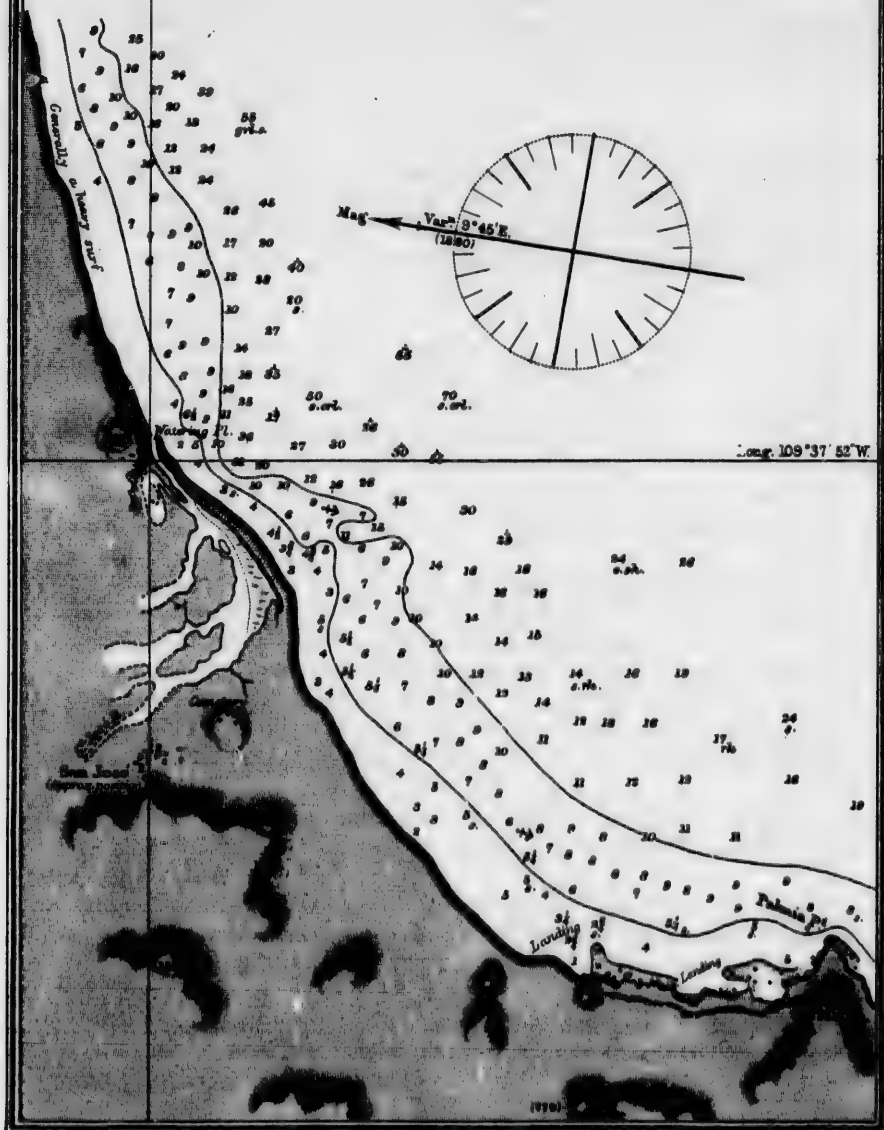
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Point Pescaderos, 15 miles south-eastward from point Perico, is similar in character to the latter and has hills around it, rising to a considerable height. The land recedes between these points, forming the open bay of Muertos. At the back of this bay the land rises to a height of nearly 5000 feet, with a gradual descent on the south side of the bay to a sand beach, 10 to 50 feet high, and on the northern to a broken rocky shore. Anchorage can generally be found within half a mile of the beach, in 8 to 15 fathoms.

Arena Point, called Observation point by Com. Dewey U.S.N., lies 19 miles S.E. $\frac{1}{2}$ E. from point Pescaderos. It is a low point, with sand-spits and heavy surf on its northern and western sides. The coast between the above points falls away 8 to 5 miles, forming Palmas bay. This, like all the other bays between San Lucas and San Lorenzo channel, is entirely open to easterly winds, and affords no shelter in the dreaded south-easterly gales.

In the northern part of Palmas bay, the hills extend to the water with rocky cliffs. The southern part is less broken, the coast being low and sandy, rising gradually to the coast range of mountains a few miles inland. On the south side of the bay is quite an extensive plain covered with cactus and low bushes.

Immediately southward of Arena point is an open bay, $1\frac{1}{2}$ to 2 miles in depth. The point and southern shore of this bay should not be approached nearer than a mile without the greatest caution. Anchorage may be found 2 miles inside the point one mile from shore, in 7 fathoms water. There is a bar a quarter of a mile in-shore of this anchorage extending nearly to the point, with 8 to 5 fathoms on it and indications of shoaler spots.

High Bluff, about $6\frac{1}{2}$ miles S.E. by S. from point Arena, is a rocky bluff, 71 feet high, surmounted by a hill 384 feet high. Shoal water extends off this headland a short distance in every direction.

Cape Pulmo, $4\frac{1}{2}$ miles S.S.E. from High bluff, is a bold rocky bluff 410 feet high, surmounted by a hill 796 feet high. There is a small white outlying rock, about 12 feet high, half a mile northward of the middle of the bluff.

Cape Porfia, a bold rocky headland $8\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from cape Pulmo, may be recognised by its light grayish colour, differing several shades from other points in the vicinity. Sunken rocks lie close off the cape.

Cape Polfia, 10 miles S.S.W. from cape Porfia, is low and rocky, with a heavy surf breaking upon it at all times. The coast between these two capes is moderately low and rocky, with occasional sand-beaches sloping back gradually to the mountain range in the interior. About midway between the points is a low sand point, with discoloured water extending off a mile or more. A few miles south-west of cape Polfia is point Gorda, a round rocky bluff, 800 feet high.

San Jose del Cabo Bay.—Point Gorda forms with point Palmia, $8\frac{1}{2}$ miles farther south-westward, an open bay known as San José del Cabo. Here a vessel may anchor in 6 to 9 fathoms water, a third of a mile from the beach in any part of the bay; but the best anchorage is about a mile to the northward of Palmia point, in 9 fathoms, sandy bottom, and abreast of a small sand-beach. Here, too, is the best boat-landing. A heavy swell sets into the bay at all times, making anything but a desirable anchorage or landing.

The land about the bay consists of low sand-beaches and rocky patches, rising to moderately high hills a short distance inland, with the mountain ranges of Victoria and San Lázaro farther back.

The river San José empties into the sea about three miles from Palmia point, watering an extensive valley of the same name for many miles in the interior. The village of San José del Cabo is on the bank of the river about a mile from the sea. The geographical position of the entrance to the river, according to the Admiralty Chart No. 1960, edition 1879, is lat. $28^{\circ} 8' 15''$, long. $109^{\circ} 37' 52''$. Here a ship may obtain a supply of wood, water, beef, and vegetables at a moderate price. The salt-marsh between the beach and San José is known as the *Salutea*.

Palmia Point, the south-western extremity of San José bay, is low and rocky, with detached rocks; it is backed by a mound 315 feet high. A short distance to the westward and on the coast is Cerro Colorado, 540 feet high, and of red sandstone. This is an excellent landmark, being the only formation of the kind between cape San Lucas and San José bay.

Cabeza Ballena, $9\frac{1}{2}$ miles S.W. $\frac{1}{4}$ W. from Palmia point, is a rocky bluff 200 feet high, of dark colour and with detached rocks extending a short distance from the point. For about 3 miles to the northward and eastward the coast is rocky and moderately high; thence to Palmia point it is low and sandy, sloping gradually to a mountain range a short distance inland.

CAPE SAN LUCAS.—About $8\frac{1}{2}$ miles S.W. $\frac{1}{4}$ W. from Cabeza Ballena is a group of rugged rocks, some being 250 feet high, rising perpendicularly from the water. These rocks form the extremity of Cape San Lucas and are known as *Los Frailes*. On certain bearings these rocks are grotesque in their outlines, and are backed by a conical mound, 200 feet high, ending a short range of hills. The approximate geographical position of the cape is lat. $22^{\circ} 53'$, long. $109^{\circ} 50'$.

Cape San Lucas is of moderate height, and a few leagues northward from it the land rises so high as to be seen at the distance of 20 leagues. When in this neighbourhood, it is recommended to keep the lead constantly going, because the low shore is occasionally hidden by the haze which frequently prevails even when the weather is clear out at sea. At the distance of 27 miles from this coast, the depth is about 70 fathoms.

From cape San Lucas the coast trends westward about 3 miles to cape Falso, which is so named because at a distance it bears some resemblance to, and has consequently been frequently mistaken for, cape San Lucas. The coast between is a succession of sand-beaches and bold rocky bluffs, against which the sea breaks heavily even in the finest weather.

North of cape Falso, a short distance inland, are the Paps of San Lucas, two remarkable peaks about 600 feet high.

Captain Wilcox, U.S. Navy 1850, rounded cape San Lucas at the distance of about 15 miles. When the cape bore N.E. by E. and cape Falso N. by W., the land appeared high, bold, and in the vicinity of the capes mountainous. He remarked especially that the white chalky cliffs rendered the coast easy of recognition as they are visible at a considerable distance. The harbour he alludes to, we consider, can scarcely be the well known bay of San Lucas on the east side of the cape, as that bay

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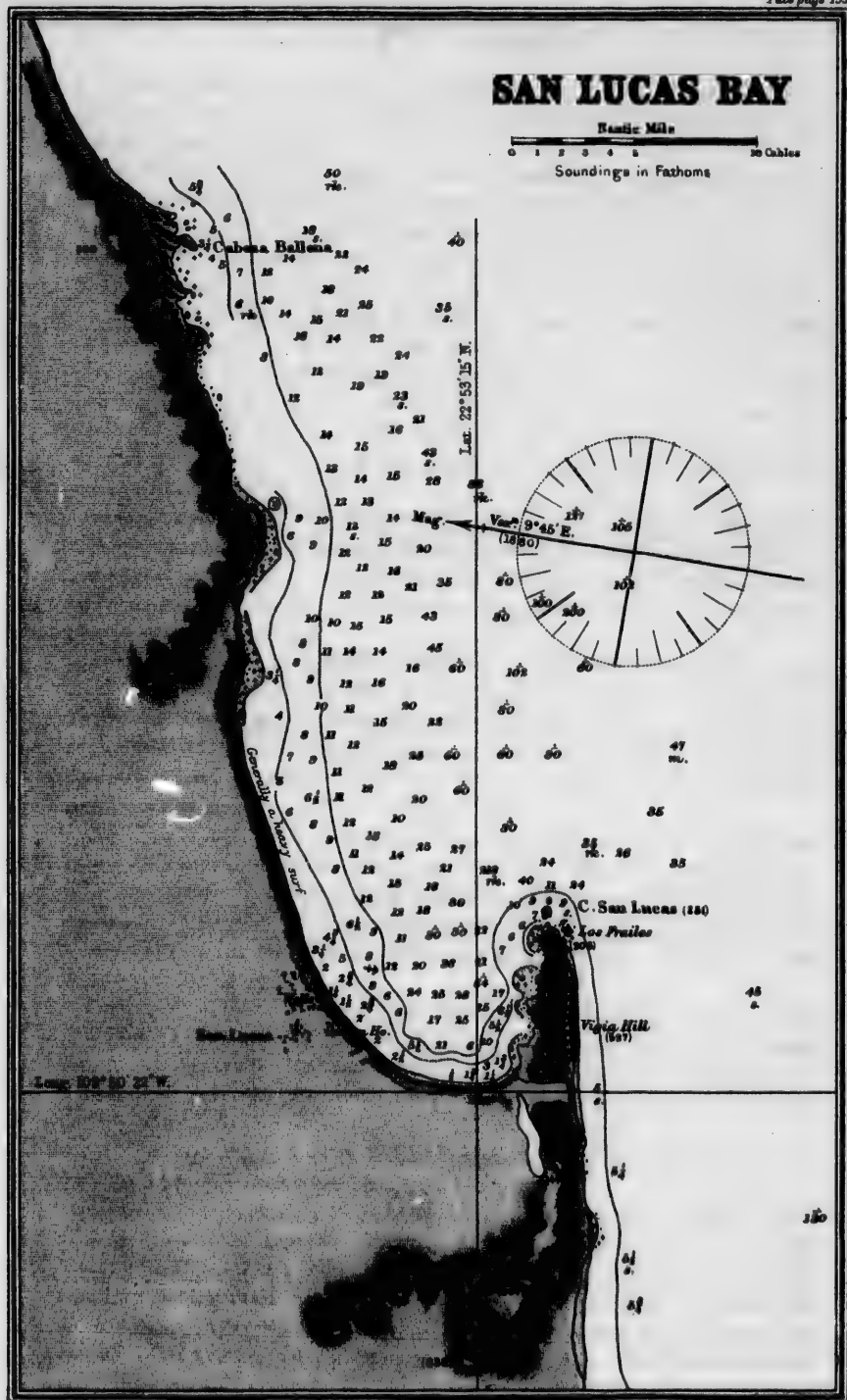
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SAN LUCAS BAY



is sheltered from northerly winds and exposed to those from south-eastward, but must be on the north side of the cape; it is not mentioned on any charts of the coast we have met with. He says "We ran into the little harbour of cape San Lucas anchoring in 16 fathoms water, within a cable's length of the shore. The harbour is but 2 miles in width, protected from the south-east by a high rocky bluff, but perfectly exposed to the north and west. It is an extremely dangerous anchorage, as a heavy surf is continually rolling in, and no bottom is found at 100 fathoms, till close into the beach."

San Lucas Bay is on the east side of the cape; the anchorage here is very limited, being confined to the north-western side, the deep water extending almost up to the beach.

In entering the bay steer about W.N.W. for Ritchie's, a large white house of two stories and the first object seen in making the anchorage. Have the anchor all ready, as the bank is very steep, and come to in 6 or 7 fathoms, a third of a mile from the beach. This is an unsafe anchorage in the summer or wet season, as south-easterly gales are both frequent and heavy.

Supplies.—Excellent fresh beef and vegetables can be obtained here at moderate prices, and there is also an abundance of tolerable fresh-water. The best water is obtained at the wells sunk in the bed of the arroyo, about half a mile from the beach. Wood can also be had. The settlement consists of about a dozen houses, with a population of 150.

In reference to the bay of San Lucas Captain Sir E. Belcher, R.N. observes "they were nearly making a sad mistake, after shortening sail, by finding after they cast in 10, they had no bottom with 88 fathoms, just as they were about to let go the anchor. This shows the necessity of keeping the lead on the bottom before letting go an anchor.

This bay was first named *Aguada Segura* by the Spaniards, and afterwards altered by Vizcaino to that of San Barnabe, it being the festival of that saint when this navigator entered it, in 1602. It is the same bay in which Cavendish landed his prisoners, 190 in number, when he anchored there with his prize, the *Santa Ana*, taken from the king of Spain, in 1587. Some Americans and Californians now reside there, who supply the whalers which annually resort there with water, wood, cattle, vegetables and fruit. The country is mountainous and sterile about the cape, and the supplies are brought from the valley of San José, about 20 miles to the northward, which is well cultivated. The water, which is procured from the wells, is sweet when drawn, and is very bright, but is impregnated with muriate of soda and nitre, which pervade the soil. It consequently soon putrifies on board."

It has been remarked in Captain Rogers's account of his voyage round the world, in 1710:—"This port is about a league eastward of a round, sandy, bold headland, which some take to be cape San Lucas, because it is the southernmost land. The entrance into the bay may be known by four high rocks, which appear like the Needles at the Isle of Wight (England) when seen from westward. The two westernmost are in the form of sugar loaves, and the innermost of them has an arch, through which the sea makes its way. Leave the outermost rock about a cable's length on the port hand, and steer into the deepest part of the bay, being all bold, where vessels may anchor in from

10 to 25 fathoms depth. Here you may ride land-locked from all winds, save those between E. by N. and S.E. by S. Yet it would be but an ordinary road if the wind should come strong from the sea. The starboard side of the bay is the best anchoring ground, where vessels may ride on a bank that has from 10 to 15 fathoms depth. The rest of this bay is very deep; and near the rocks on the port side going in there is no ground. This is not a good recruiting place."

CAPE SAN LUCAS TO POINT CONCEPCION.

Magnetic Variation in 1879:—Off Cape San Lucas 9° 45' E.; at Magdalena Bay 10° 20' E.; Ballenas Bay 11° E.; Sebastian Viscaino Bay 12° E.; Colnett Bay 13° E.; San Diego Bay 14° E.; Point Concepcion 14° 50' E. The annual increase is estimated to be about 2 minutes.

GENERAL REMARKS.—The entire coast of Lower California, from the United States boundary-line to La Paz, with the exception of San Lucas bay and the valleys of Todos Santos and San José del Cabo, is barren in the extreme. The land is generally high and precipitous and its approaches bold. There are many places where a ship may anchor and find protection from the prevailing coast-wind.

During the summer months, strong south-east gales of short duration are frequent in the vicinity of cape San Lucas, but they rarely extend so far north as Cedros island. During the months of June, July, August, and September, winds from northward and westward are experienced on the Pacific coast of the peninsula. The nights are ordinarily calm, with heavy dews. The breeze springs up from the westward about 9 a.m., hauling gradually to the northward as the day advances, and attaining its greatest force about 3 p.m. Occasionally there are light southerly winds; but the prevailing winds are from northward and westward.

Between San Diego and Cedros island, during the month of September, the weather is said to be misty and foggy during the night, clearing up every morning about 10 a.m., and for the remainder of the day it is clear and pleasant. Southward of Cedros island fog is much less frequent, the mornings clearing earlier, the temperature lower, and the winds lighter.

The tides are influenced by the prevailing wind, and set from one-quarter to three-quarters of a knot per hour. A strong current has been observed setting to the eastward around cape San Lucas.

THE COAST.—Cape San Lucas has already been described (see page 158). The coast thence to the westward is a succession of sand-braches and bold rocky bluffs, against which the sea breaks heavily even in the finest weather. About 8 miles westward of cape San Lucas is cape Falso (or False San Lucas), a rocky bluff, with many detached and outlying rocks in its vicinity. Here the coast bends round to the north-westward and the first point met with is San Christobal, distant 7 miles N.W. by W. $\frac{1}{2}$ W. from cape Falso.

Point San Christobal is a bold rocky bluff, about 50 feet high, with many outlying rocks around it. About 5 miles northward is the Cerro de las Playas, a conical hill about 500 feet in height.

La Tinaja (the pitcher) is distant about 10 miles North from point San Christobal. It is a rocky bluff of moderate elevation, so called because of a cavity or basin on its summit, which, filling with water during the wet season, affords a watering-place for the cattle of the neighbouring rancho.

San Pedro Point, 30 miles northward of San Christobal point, is the eastern extremity of a rocky promontory about 200 feet high, of which Lobos point is the western extremity. The intermediate coast consists of a succession of sand-beaches and rocky patches (forming slight projections in the coast-line) and is in general low, rising to a height of 500 to 1000 feet a short distance inland.

San Pedro is a small settlement, situated on the bay of that name, 2 miles from San Pedro point. Landing is said to be practicable here in ordinary weather.

Seven miles to the southward of Lobos point is the open bay of Pescaderos, having a small fishing village half a mile from the beach.

Todos Santos.—Northward of point Lobos, distant about 2 miles, is point La Poza, the end of a table-land extending from the vicinity of point Lobos. It is a perpendicular bluff about 50 feet high, with numerous outlying rocks. At this point the river Todos Santos empties into the sea; it is a small stream flowing the whole year and watering the fertile valley of the same name.

Todos Santos village, containing about 800 inhabitants, is situated about three-quarters of a mile behind the beach. This is an excellent place for a ship to get fresh provisions and water.

This valley is said to be one of the most fertile on the peninsula, there being an abundance of water for irrigating purposes. The gardens and fields are many acres in extent. Figs, oranges, and sugar-cane are produced, the last being by far the most important; many thousand pounds of sugar being manufactured every year.

About 8 miles northward from point La Poza is a grove of palms situated quite near the beach.

Point Marquis, in latitude $23^{\circ} 56' 30''$, is low and rocky, forming a sharp projecting point on the coast-line, and is the first rocky formation seen after leaving Río Todos Santos.

El Conejo Point, in latitude $24^{\circ} 2'$, 47 miles N.W. by W. & W. from point Marquis, is on the eastern side of the boat passage, which leads into Santa Marina bay. The east extremity of the low sand island, named Cresciente, about 10 miles in extent E.N.E. and W.S.W., forms the western side of this boat passage. El Conejo point is low and rocky, backed by a dome-shaped mound about 50 feet high.

The coast between Lobos and El Conejo points, is low, sandy, and barren, with table-lands, 100 to 200 feet high, a mile or two back, rising gradually to an altitude of 2000 feet 20 miles inland. A ship may anchor off any part of this coast in fine weather, in 8 or 10 fathoms, a mile or two from the beach. The soundings are regular, shoaling gradually toward the beach.

SANTA MARGARITA ISLAND.—From Santa Marina point, the south-west end of

Cresciento island, to cape Tosco, the southern extremity of Margarita island, the distance is nearly 4 miles and bearing S.S.W. $\frac{1}{2}$ W. Between these points is a passage into Magdalena bay, named Rehusa channel; it is, however, too shoal and intricate for anything but boat-navigation. Margarita island is about 20 miles in extent, W.N.W. and E.S.E., and 2 to 4 miles in width; it is high and barren, and of volcanic origin. It presents a bold rocky face its entire length, except about midway where the coast falls away somewhat, forming an open bay called Pequena; here the land is low and sandy. Mount Margarita, near the southern end of the island, is 2000 feet high. The two remarkable peaks just south of Pequena bay, about 1000 feet high, are known as the Sisters. On the southern end of the island there is a spring of excellent water.

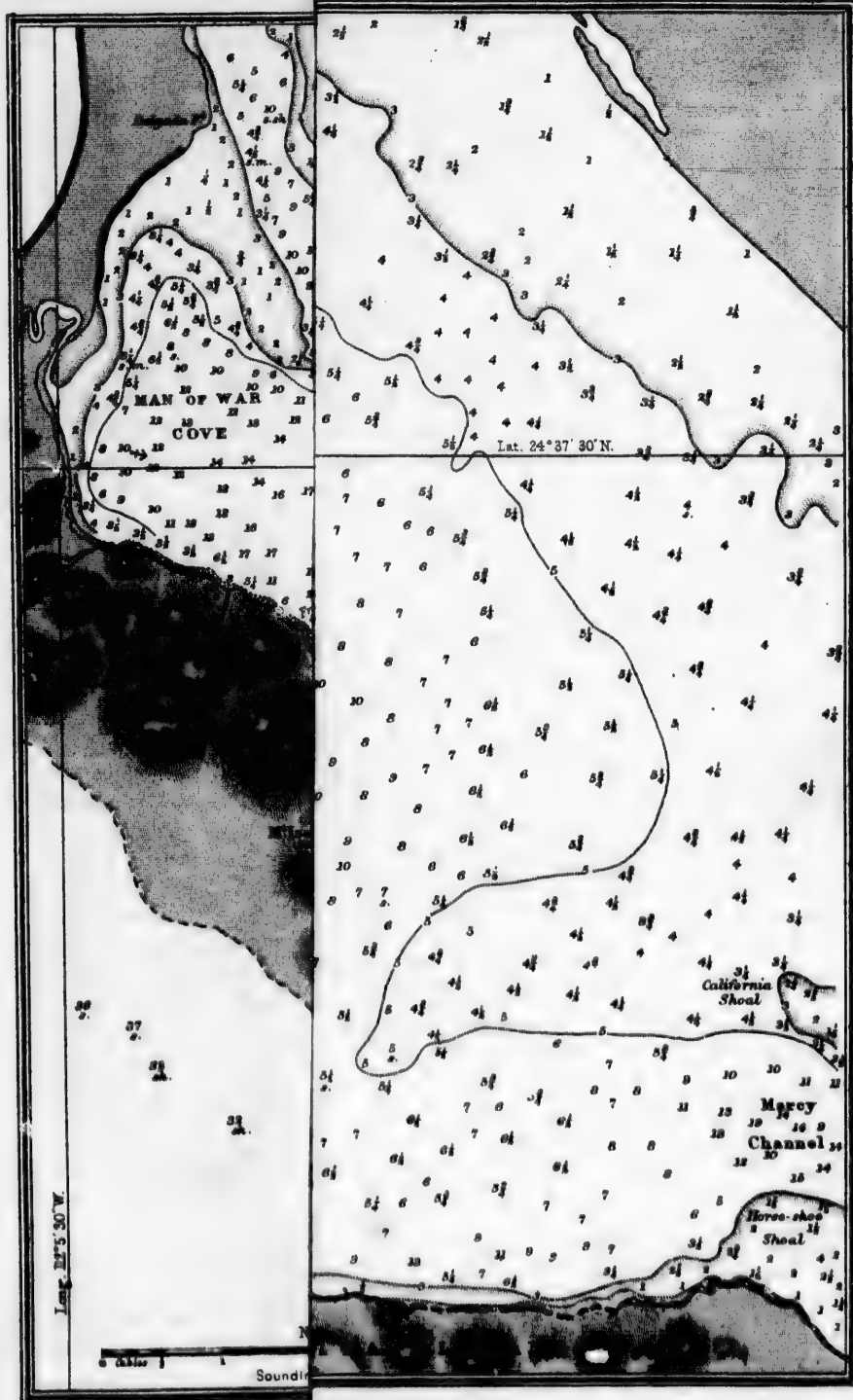
Cape Tosco is a bold rocky point, with a reef of rocks extending off S.S.E. about 3 cables, over which the sea breaks constantly.

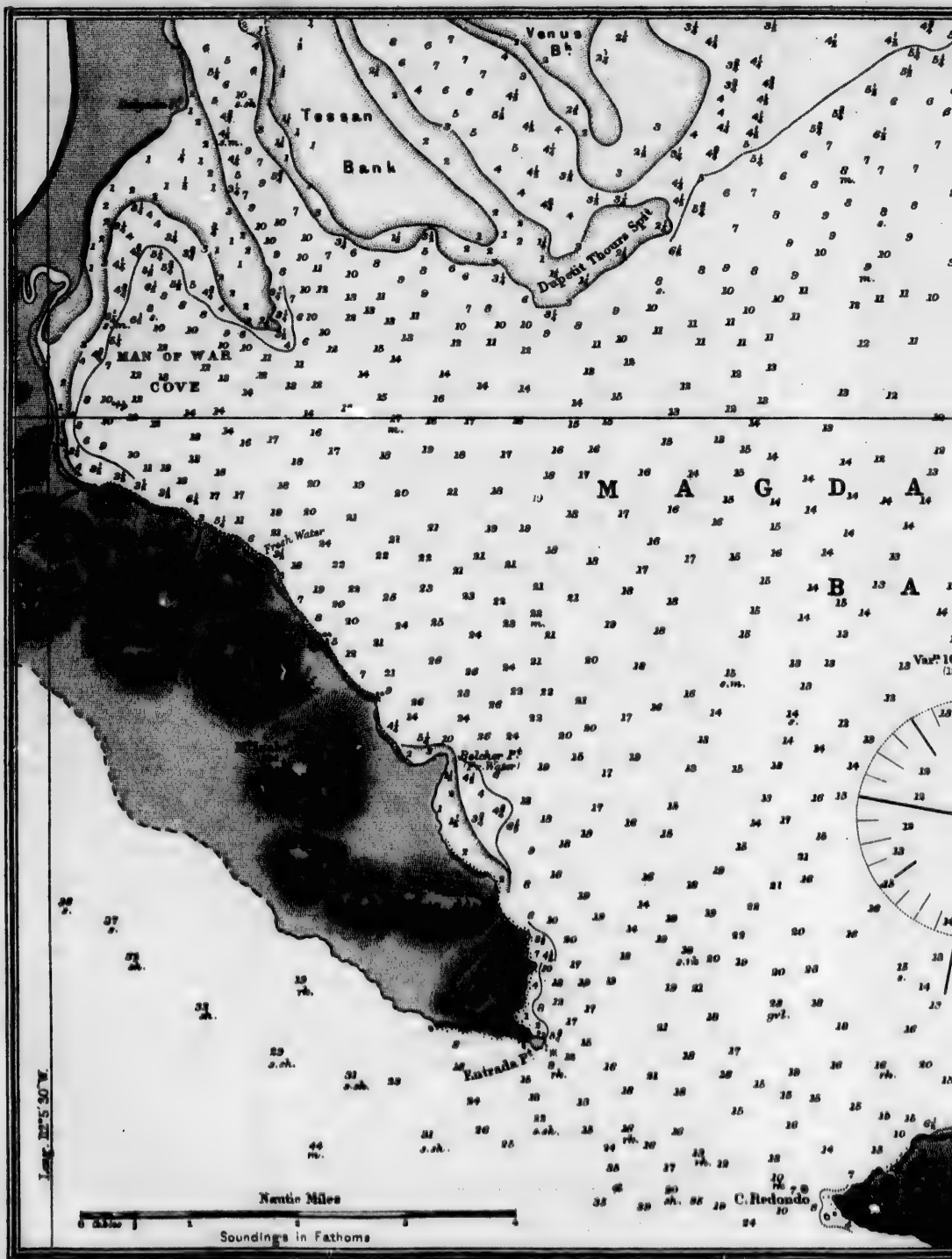
Cape Redondo is a round rocky headland, nearly 100 feet high, the land rising rapidly behind it to a height of 500 or 600 feet. A reef extends off to the north-west about 8 cables from the cape.

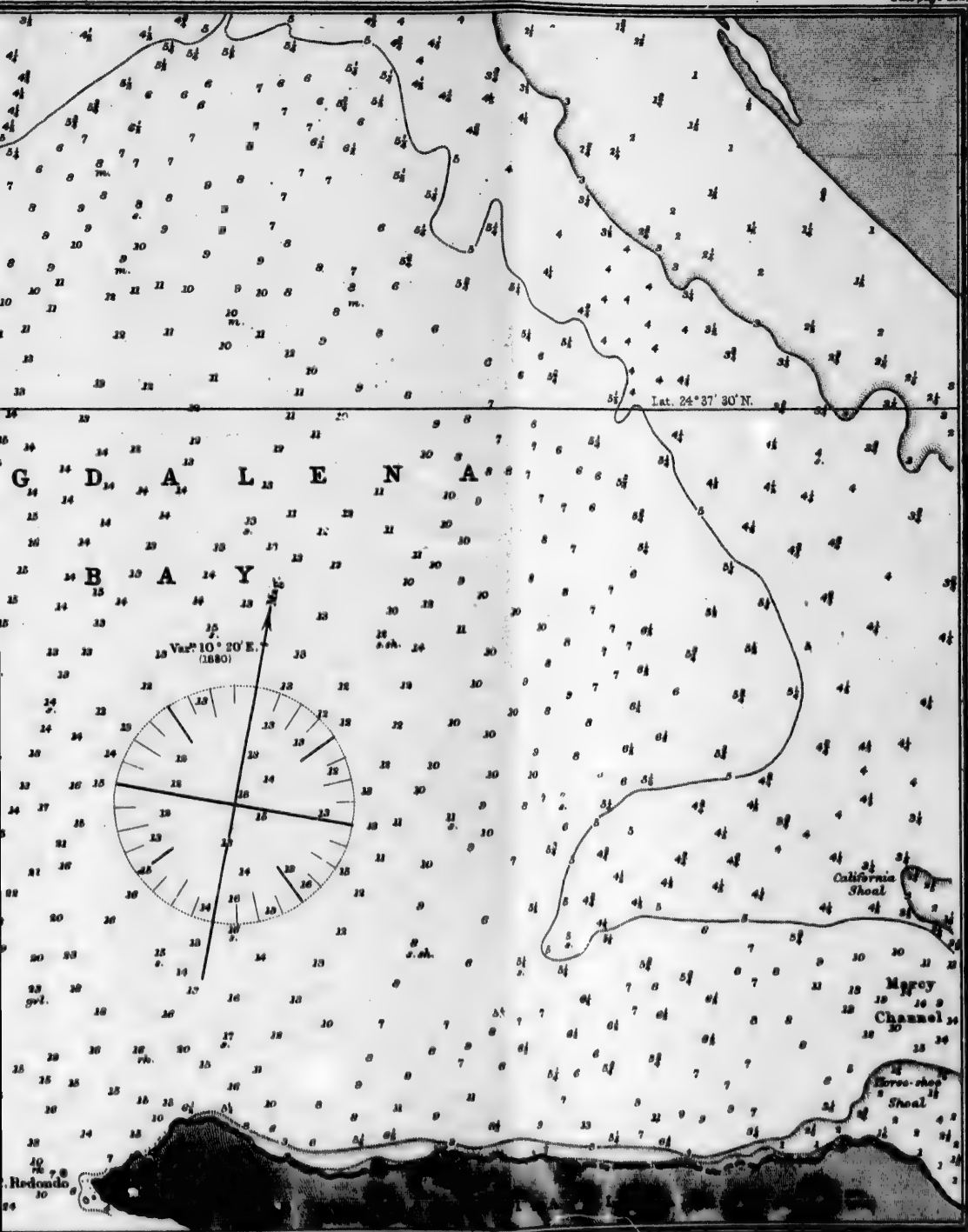
MAGDALENA BAY.—This extensive inlet lies between longitudes $111^{\circ} 30'$ and $112^{\circ} 15'$. It is protected from the sea in a south-westerly direction by the large island of Margarita, and has soundings over nearly the whole of its extent of 20 to 10 and 4 fathoms. Its principal entrance is at the west end of this island, through a channel 8 miles broad, and here the width of the bay (from the entrance to the main land opposite it) is about 12 miles; consequently there is ample room for the accommodation of almost any number of vessels. Entrada point, the western point of the entrance, is a dome-shaped hill about 200 feet high, connected with the mainland by a narrow strip of sand and rock but a few feet above high-water. There are several out-lying rocks from 10 to 12 feet high quite near it, and a reef making off south-east about 3 cables, over which the sea generally breaks. The channel between the reefs off cape Redondo and Entrada point is at least 2 miles wide and free from all dangers. The tide runs with considerable force through this channel, at the rate of one to two knots per hour. Cape San Lazaro, which may be considered the north-western boundary of the bay, is 1800 feet high.

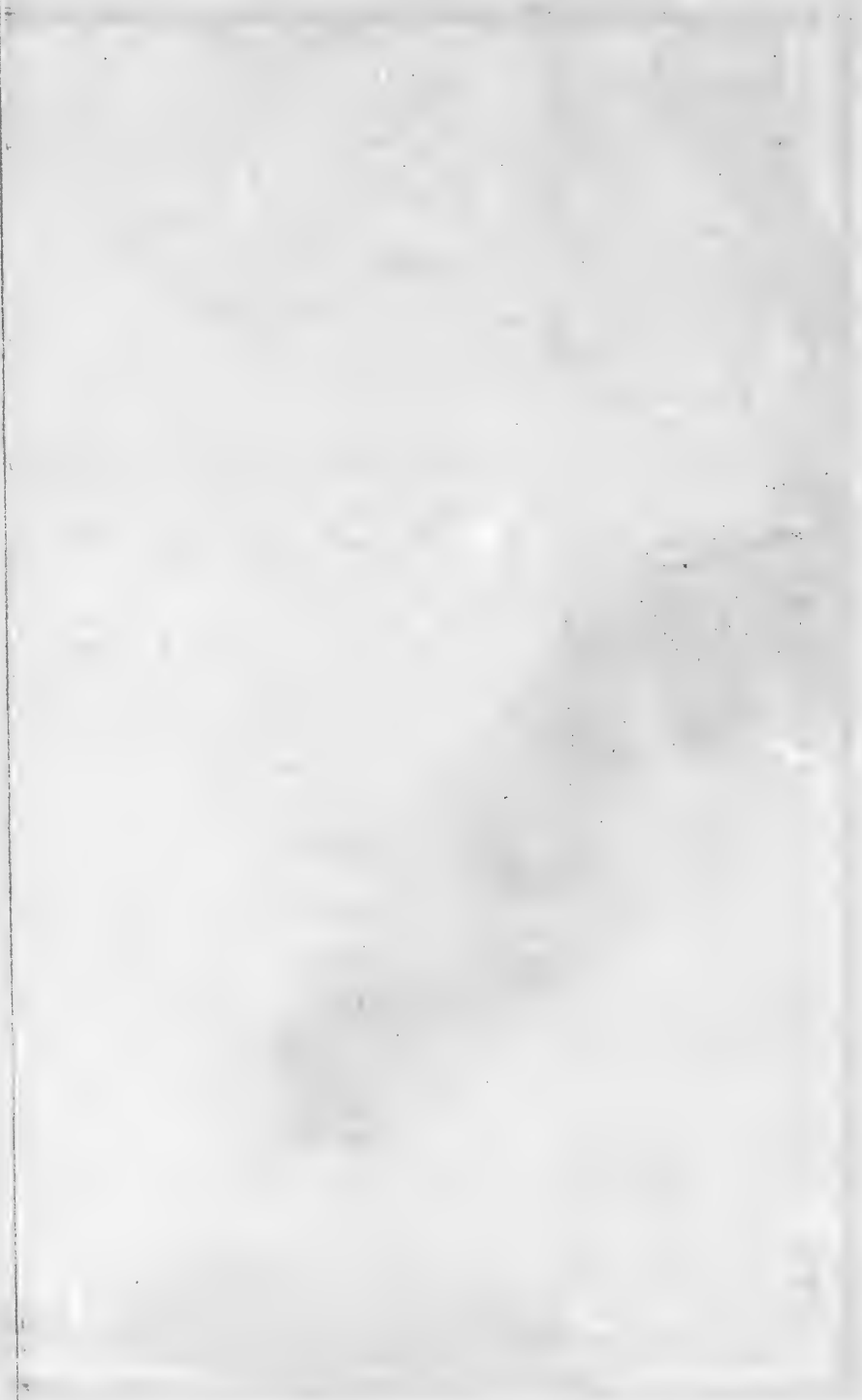
Magdalena bay was surveyed in 1837 by Captain Du Petit Thouars of the French Navy, and in 1880 by Captain Sir Edward Belcher, R.N. To the chart of the latter officer, published by the Admiralty (No. 1930), we must refer our readers, as a written description of the bay will necessarily convey a very inadequate idea of the advantages it possesses.

The shore on both sides of the bay is lined with rocks, so that it is recommended to keep as near the middle as possible, where will be found 12 to 18 fathoms water, rocky bottom, with shells. When within, there is a similar depth on sand and shells. At the head of the bay, in its north-west corner, are numerous sand-banks having between them a channel 5 fathoms deep, which runs up the coast past cape San Lazaro as far north as lat. $25^{\circ} 30'$ or even farther; northward of the cape this channel is divided from the sea by a very narrow belt of low land covered with sand hills. The land forming the north side of the bay is so little above the sea level that when off the north-west end of Santa Margarita island it cannot be seen from the deck.









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Captain Du Petit Thouars says :—"The high land of cape San Lazaro affords an excellent mark for making the land, as it can be seen at the distance of 10 or 12 leagues. The entrance of the bay is 8 miles wide and very brief. It presents no difficulty, if only care be taken not to go too near the south point, because of a detached rock, on which the sea breaks, situated about half a mile from the point. In tacking, when within the bay, care must be taken to avoid the Venus bank ; it is necessary also to keep sufficiently far from the low land to the East and N.E.

Anchorage can be obtained in the north-west part of the bay, or in the south part of it, according to the prevailing winds. The holding ground is moderately good.

The bay offers no resources, as there are neither houses, wood, nor water.

Outside the bay, the current runs southward, with a strength of about one-third of a mile per hour.

The tides are regular, and occasion very strong currents at the entrance of the bay. It is high water, on the days of full and change of the moon, at 7h. 37m. The tide rises about 6½ feet.

The following remarks on making Magdalena bay are by Captain W. H. Parker, P.M.S.S. Co., 1871 :—"In entering this bay keep over towards point Entrada. The best anchorage, at all seasons, is probably abreast the spot marked "Obs'y" on Belcher's chart, about 7 miles N.W. from point Entrada. To reach it you have only to follow the land around from the point, at a distance of three-quarters of a mile and anchor in 10 or 12 fathoms water.

During the prevalence of northerly winds the best anchorage is, perhaps, at the head of the bay. It is here I have generally seen whalers at anchor. To reach it, run about N. by E. ½ E. from the entrance to the harbour, and anchor in 7 or 8 fathoms ; observing not to bring point Entrada to the eastward of S. by W. ½ W. This will insure your being clear of Dupetit spit.

The anchorage on the eastern side of the bay, towards Mangrove island, is more exposed to the winds.

At present, when we have passengers for Magdalena bay, they are met by a boat off point Entrada. It is not yet determined where the anchorage for our steamers will be when we enter the bay. This will depend upon the permanent location of the colony.

There is not the least difficulty in entering the bay by day or night. You will, of course, keep the lead going."

Sir Edward Belcher, R.N., observes, "I was fully prepared to have found, as the name imported, an extensive bay ; but on entering the heads, which are about 2 miles asunder, no land could be discerned from the deck, from N.W. to N.E. or East ; and even after entering, it was quite a problem in this new sea where to seek for anchorage, our depths at first, even near the shore, ranged from 17 to 80 fathoms. However, as the prevailing winds appeared to be westerly, I determined on beating to windward, in which it eventually proved I was correct. About 4h. p.m., we reached a very convenient berth in 10 fathoms, with a very sheltered position for our observatory. Preparations were immediately made for the examination of this extensive sea, or what I shall in future term the gulf of Magdalena.

It is probable that this part of the coast formerly presented three detached islands

viz., San Lazaro range, Magdalena range, and Margarita range, with one unnamed sand island, and numerous sand islets. It is not improbable that its estuaries meet those from La Paz, forming this portion of southern California into an immense archipelago.

The first part of our expedition led us up the northern branch of what held out some prospect of a fresh-water river, particularly as frequent marks of cattle were noticed. In the prosecution of this part of our survey we noticed that the San Lazaro range is only connected by a very narrow belt of sand between the two bays, and that the summit of some sand-hills were covered in a most extraordinary manner, by piles of fragile shells, which resembled those recently found in the gulf. The cliffs throughout the Gulf also abound in organic remains.

Having explored the westernmost estuary, about 17 miles northward of our observatory, until no end appeared to its intricacies, I resolved on attempting a second, which afforded a wider entrance, and afforded deeper water. This was examined about 4 miles beyond the last, and it still offered ample scope for employment, the advanced boat being at that moment in 4 fathoms, and distant heads in view; but considering that sufficient had been done to show that no hope offered of reaching fresh-water, and that the still unexplored state of the gulf would engross all our spare time, I determined on adhering to its main outlines, which eventually offered so many intricacies as almost to baffle our patience.

One circumstance connected with the examination of the second estuary afforded very strong proof that no fresh-water streams were in the vicinity. It was the fact of finding near our advanced position many large specimens of the *asteria* medusa, or euryale, an *asteria* seldom found but in pure, and generally deep salt water. At least twenty were taken by the dredge.

By the 9th of November we had reached the eastern end of the first gulf, when the ship was moved into the second, the channel or strait connecting them being not more than a quarter of a mile wide. I had been very sanguine in my expectations that we should have discovered a safe channel out by the eastern end of the island of Margarita; but until satisfied upon that point I took the *Starling* and boats to explore. I found that our boats, and, upon emergency, the *Starling*, might have passed out, but it was far too doubtful and intricate for the ship.

After all the time expended (18 days) on this immense sheet of water, it will naturally be enquired, what advantages does the port offer? The reply is: at the present moment, shelter; and from several water-courses nearly dry at the time of our visit, it is evident that very powerful streams scour the valleys in the winter season, which in this region is reckoned between May and October.

Fuel (mangrove) can be easily obtained in the *esteros*.

As a port for refit after any disaster, it is also very convenient; and for this purpose either our northern or southern observatory bays may be selected. The latter would afford better shelter, but the former is certainly more convenient, and less liable to difficulty of navigation, the access to it being entirely free from shoals.

In war it would be a most eligible rendezvous, particularly if watching the coasts of Mexico or California, as no one could prevent the formation of an establishment, without adequate naval force; and the nature of the country itself would not maintain an opposing party.

The island of Margarita would afford an excellent site for a deposit for naval stores. Martello towers on the heads of the entrance would completely command it, and, excepting on the inside, no force could be landed.

Water would doubtless flow into wells, of which we had proof in spots where the wild beasts had scraped holes; but from some (no doubt removable) causes, it was intensely bitter. There is nothing in the geological constitution of the hills to render it so.

The ranges of hills composing the three suites of mountains, vary from 1500 to 2000 feet."

Cape Corso, 10½ miles N.W. by W. from Estrada point, is a bold rocky point, fronted by a white sand bluff, which nearly encircles it, the coast between being a succession of rocky points and intervening sand-beaches, the land rising abruptly to a height of 500 to 1600 feet. Mount Isabel, the highest point, is 1592 feet high.

Cape San Lazaro is a high remarkable-looking headland of volcanic origin, which can be seen for many miles, and when first made out has the appearance of an island. It extends about 4 miles N. by W. and S. by E. and is 600 to 1800 feet high. Its southern extremity is distant about 7½ miles N.W. ¼ W. from cape Corso. The coast recedes between these two points, forming the bay of Santa Maria, 8 miles deep, where good anchorage may be found in 7 or 8 fathoms, a mile from the beach. The land around the bay is low and sandy.

From cape San Lazaro the coast trends nearly North 77 miles to San Juanico point, in about lat. 26° 8'. From the former point to within 10 miles of the latter the coast is merely a low sand-beach, with high land many miles in the interior; thence northward the land is higher a short distance back.

In lat. 25° 16' there is a shallow entrance to the lagoon called Boca Soledad, and in lat. 25° 30' another called Boca de San Domingo. Neither of these entrances can be used except by boats or flat-bottomed vessels of light draught. Shoal water and breakers extend off all these entrances, as indeed off the whole of this coast. The soundings are 7 to 12 fathoms 2 or 8 miles from the beach, the entire distance between the points.

Point San Juanico is low and sandy; south-eastward of it is an open bay where ships may anchor in 5 or 6 fathoms, a mile and a half from the beach, and find shelter from the coast wind, avoiding the sand-spit which makes off about a mile to the southward of the point.

Here is the entrance to the San Juanico lagoon, which is used by the small coasters, carrying 6 or 7 feet, at the highest spring tides. The lagoon extends inland several miles, but is very shallow.

Point San Domingo, 27 miles N.W. by W. ¼ W. from point San Juanico, is a remarkable perpendicular rocky cliff, of dark colour, the cliff extending several miles above and below the point.

The coast between points San Juanico and San Domingo is formed chiefly of sand-hills, 100 to 200 feet high, with high table-lands a few miles in the interior.

About 15 miles north-west from point San Juanico is a small cove, known as Pequena bay, where a vessel may find shelter from the coast wind.

Ballenas Bay.—From San Domingo point the coast trends N.W. by W. ¼ W. for

about 40 miles and then bends round to the westward and southward, forming Ballenas bay; this coast is low and sandy with several lagoons close behind the beach.

Ballenas bay is so named on account of its being a favourite resort of the hump-back species of whale. The western limit of the bay is formed by Abreojos point, hereafter described. The soundings in it are reported to be regular and to extend a considerable distance from the shore; at less than a mile from the beach the depth is asserted to be 8 fathoms, whence they increase gradually seaward. The bay affords no shelter, as it is quite exposed to southward and south-westward, from which quarters a heavy sea is sent in when the wind blows with any force.

In the eastern part of Ballenas bay, in about lat. $26^{\circ} 45'$, is the entrance to a very extensive lagoon, which is probably deep enough in some parts to admit vessels drawn not more than 12 feet at high water; it is known as the San Ignacio lagoon. Its principal branch is about 2 miles wide at its mouth; after running northward for 8 miles, it turns a little to westward and doubles its width at 6 miles from the bar, then gradually contracting it ends at 8 miles farther up, making the whole length 14 miles. A small branch, making from the south part of the entrance and taking a more easterly course, runs through a low flat country 12 to 15 miles when it reaches a high table land. Another small estero, 15 miles farther south, emptying into the sea, joins the southern branch of the main lagoon.

Near the head of this sheet of water are two islands, not more than 4 miles in length and 1 in width; both are very low. The upper island, on its highest part, has a growth of trees and low bushes, which gives it a pleasant contrast with the surrounding country. The southern island is quite barren. The face of the country, immediately in the vicinity of this inland water, on either hand, is low, quite level, and extremely barren; a few stunted shrubs and trees are now and then met with, and a species of rush grass is found in many places, but so scattered that no appearance of anything but a sandy desert plain is seen a short distance from the shore. To the south-eastward rises a long table-land, to the height of 1000 feet or more, and then comes a wild mountainous country as far as the eye can see.

It is stated there is trail leading from this lagoon to another, called Ojo de Lievre, the distance being 70 miles. The native name of this lagoon is Susa Maria. In a northerly direction from its head, distant 85 miles, rises a mountain, showing three swells of land at its summit; it is called San Ignacio, and at its foot is a mission bearing the same name. As this mountain is viewed from the coast, a still higher elevation is seen, standing alone, with rounded peak. At its base are hot sulphur springs.

The entrance to this fine body of water is shoal, narrow and extremely dangerous, on account of the strong currents running in different directions at different stages of the tide. A depth of 7 feet of water only is found at low tide; the rise and fall is about 6 feet. A heavy swell usually rolls on the bar at full and change of the moon, and it is only practicable for small vessels of light draught.*

At the head of the bay is the entrance to another lagoon which extends inland about 8 or 10 miles in a northerly direction.

* See the *Mercantile Marine Magazine*, Vol. for 1860, from which the description of this lagoon is chiefly taken. All the coast between Magdalena bay and San Diego, in lat. $32^{\circ} 41'$, is very little known, and is believed to be very imperfectly delineated in the charts.

The entrances to all of the lagoons above described, with the exception of that to the San Ignacio lagoon, are narrow and shallow, being merely boat passages in smooth weather; heavy breakers and shoals extend off the mouths of all of them.

Abreojos Point, the western point of Ballenas bay, is low and sandy; its approximate geographical position is lat. $26^{\circ} 42'$, long. $118^{\circ} 32'$. A reef extends a short distance south of the point, and many detached rocks on its eastern side.

A dangerous reef is situated about 6 miles W.S.W. from Abreojos point; the passage between the reef and the point is dangerous and should be used with great caution. A small rock known as the Whale rock, about 4 feet high, is on the inner end of the reef. Shoal water makes off 2 or 3 miles south-east from the point. Indeed, the whole locality is dangerous, and no vessel should approach this part of the coast nearer than 8 or 10 miles except by day, and then with caution.

About 6 miles north-westward of Abreojos point is the entrance to a small lagoon.

San Hipolito Point, W.N.W. 27 miles from Abreojos point, is low and sandy, with a shoal making off to the southward and westward about a mile.

San Hipolito bay, immediately to the eastward of the point of the same name, is formed by the coast falling away 3 or 4 miles between the points. The coast is low and sandy, rising gradually to a height of 200 feet, with table-lands of considerable elevation a few miles inland.

Asuncion Bay.—From San Hipolito point to Asuncion islet, in about lat. $27^{\circ} 6'$, long. $114^{\circ} 16'$, the distance is about 19 miles in a north-westerly direction. This islet forms the western limit of Asuncion bay; its north end is distant one mile S. by E. from Asuncion point, a low bluff with a cone-shaped mound, 75 feet high at its outer extremity, and moderately high hills a short distance inland.

Asuncion islet is about one mile in length, N. by W. and S. by E., and half a mile wide. It is entirely barren, and is highest towards its southern end, where it reaches 100 feet. It is surrounded by detached rocks and kelp, and a reef extends nearly half way across the passage between the island and the opposite point. This passage carries 5 fathoms water, but should be used with caution and only in cases of emergency.

Asuncion bay is 3 to 4 miles deep and is said to afford good anchorage. The coast is low and sandy between the points, table-lands of moderate elevation rising a short distance inland.

San Roque Point, $7\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Asuncion point, is a light-coloured bluff 80 to 50 feet high. Between these points is the open bay of San Roque, the shores of which are low, with table-lands a few miles inland. Two miles south-east of San Roque point and about the same distance from the bottom of the bay lies San Roque islet. It is a low rugged rock, about 40 feet high, partly covered with gravel and light sand. It is about a mile long, N.W. and S.E., and a third of a mile wide. The passage between the island and the mainland is filled with rocks and reefs, and is safe only for boats.

Point San Pablo, 5 miles N.W. $\frac{1}{2}$ W. from San Roque point, is a dark slate-coloured bluff, 686 feet high. In its vicinity a few miles in the interior are extensive table-lands. To the northward and near it is a remarkable range of bare peaks 2000 to 2500 feet high, of variegated colour and great beauty, probably the range of mountains named *Sierra Pintada* by Sebastian Viscaino, in 1590.

Table mountain, 12 miles eastward of San Pablo point, is about 2200 feet high, and can be seen many miles at sea.

San Pablo Bay, between points San Roque and San Pablo, is about 2 miles deep, apparently free from all dangers, and affords good anchorage in 10 to 15 fathoms, half a mile from shore.

San Cristobal Bay.—From point San Pablo to Morro Hermoso, a bare rocky cliff in lat. $27^{\circ} 32'$, the distance is 25 miles in a N.W. $\frac{1}{2}$ W. direction. Between these points the coast recedes several miles, forming the open bay of San Cristobal, and consists generally of bluffs and sand-cliffs, 50 to 100 feet high, the coast-range rising to a height of several hundred feet, a short distance inland. The soil is of several colours, brown and gray predominating.

Thurloe Head, 7 miles north-west of Morro Hermoso, is a long cliff, high, rocky, and steep on the western side, with a more gradual slope on the south-eastern side, and many outlying rocks and kelp in its vicinity.

SAN BARTOLOME.—This bay, or harbour, is situated close to the northward of Thurloe head; it is 3 to 4 miles in diameter; circular in its general form, and perfectly land-locked in its south-eastern part, which is called Turtle bay. A reef of rocks runs in a north-westerly direction about a mile from cape Tortolo, its eastern part of entrance, eastward of which a ship may anchor in 5 to 8 fathoms, sheltered from every wind.

Cape Tortolo is a rocky point about 20 feet high, rising rapidly to an elevation of 425 feet. Mount Belcher, a mile south, is 496 feet high. The land about the bay consists of high bluffs and is entirely barren, the Santa Clara range rising to an altitude of 8000 feet a few miles in the interior. There is no indication of fresh water here. It is high water, full and change, at 9h. 10m.; springs rise 7 to 9 feet.

Kelp Point, the north-west limit of the bay, is about 80 feet high, with many outlying rocks, the whole surrounded with kelp. Mount San Bartolomé rises to a height of 850 feet a short distance from the point.

The geographical position of Kelp point, according to the observations of Com. Dewey U.S.S. *Narragansett*, 1874, is lat. $27^{\circ} 39' 35''$, long. $114^{\circ} 54' 27''$.

Respecting the bay of San Bartolomé a writer in the *Mercantile Marine Magazine*, 1860, says—"In the southern part of the bay of San Bartolomé there is a fine anchorage sheltered from all winds. The harbour is much frequented by the whalers, who resort thither to *cooper their oil*,—or to pass a few days in fishing or catching turtle. It is usually called 'Turtle bay,' by them. Wood may be procured here, in case of extreme necessity, by searching for low green bushes in the level land about the shores; the roots are found running near the top of the ground and are 8 or 10 feet long and often 6 inches through; they burn readily, and produce the required heat.

At the time sailing vessels were plying between Panama and San Francisco, occasionally some of the number, in actual distress for many of the necessary articles of provisions, put into port San Bartolomé, hoping to have their wants, to some extent, relieved. One vessel is said to have anchored here with nearly all her crew down with the scurvy, and several of them died. Numbers of hapless adventurers have found a final resting-place along the shore of the inner bay, and on an islet that breaks the ocean swell in front of the harbour. Here are found grave-boards, some rudely carved,

giving the date of interment; other graves are only marked by rough stones, and countless numbers of sea-birds nightly cover the ground above them."

About 6 miles north-westward from Kelp point is Breaker point, about 20 feet high, off which are many detached rocks, over which the sea breaks heavily. Thence the coast trends north-westerly about 10 miles to San Eugenio point.

Point San Eugenio is the extreme west point of the lofty promontory which forms the southern side of the great bay of Sebastian Viscaïno; its approximate geographical position is lat. $27^{\circ} 50' 30''$, long. $115^{\circ} 8'$.

Point San Eugenio is low, dark and rocky, projecting toward Natividad island; from it a reef extends a quarter of a mile W.S.W., and another somewhat longer of rocks above water in a N. by E. direction. A small rock, covered with guano, and known as Chester islet, lies about a mile northward of the point; another smaller rock is situated between it and the point.

CERROS ISLAND.—From point San Eugenio to Morro Redondo, the southernmost point of Cedros, or Cerros island, the distance is $12\frac{1}{2}$ miles, and direction N.W. $\frac{3}{4}$ N.

Morro Redondo is a rocky cliff about 80 feet high, with many outlying rocks, and a round hill or cone of moderate elevation just behind it; its approximate geographical position is lat. $28^{\circ} 2'$, long. $115^{\circ} 9'$.

There is good anchorage northward of Morro Redondo, in from 7 to 10 fathoms, sandy bottom, half a mile from the beach. About 5 miles northward of Morro Redondo on the east side of the island, is an excellent watering place. It may be recognised by a patch of tall rank grass behind a sand-beach about 250 feet in length, and the only one in that vicinity. It is about a mile southward of the easternmost point of the island, and the first arroyo to the southward.

The depth at less than a mile from the island is about 40 fathoms, with the exception that a bank of 5 to 10 fathoms extends 8 miles south from its south-east point in the direction of the west end of Natividad island, and to nearly the middle of the channel between them.

Cedros island is 18 to 22 miles in length, N. by W. and S. by E., and 8 to 8 miles in width. It is a high, barren island, of volcanic origin, and evidently contains much mineral wealth. Occasionally in the valleys there are a few stunted bushes and a little coarse rank grass. The highest peak, near the southern part of the island, is 3955 feet high, and may be seen on a clear day 60 miles.

In the *Mercantile Marine Magazine*, Vol. for 1860, is the following account of Cerros island:—

"Cerros is an island of mountains throughout its whole extent, being a mass of high, abrupt peaks, the highest of which is 2500 feet above the level of the sea, and may be distinctly seen, in clear weather, 60 miles. On a near approach, the sombre barren appearance of all brought to view is anything but inviting. Many of the southern slopes present a dark red hue, interspersed with high variegated cliffs, that give a little change to the otherwise dull scene. On landing, one is at once fully sensible of the extreme dry atmosphere prevailing; still there must be, occasionally, heavy rains, producing mountain torrents, which have cut their way through the sand and gravel bottoms that skirt the southern bases. These, however, are of rare occurrence, for

whalers best acquainted with the island, who have been living temporarily there, or along the neighbouring coast for the last 5 or 6 years, have never known it to be visited by anything more than light rains, and those at long intervals.

On the N.E. side, at about 8 miles from the extreme north end, a low sandy point makes out; southward of this is good anchorage during the prevailing coast winds. In a ravine near it, is a small stream of fresh water; and likewise in several of the valleys leading from the shore line, to the southward, water may be found within a mile of the beach. At one of these places it is of excellent quality. The only practicable place, however, for a ship to obtain a large supply, is on the S.E. side, where there is a spring running among rushes at the foot of a high peak close to the shore. The casks are filled by placing them within a few feet of the running stream, and conducting the water into them by means of a rough wooden spout, on the side of which are the words:—'Whoever uses this will please to put it in its proper place, for the benefit of those who may come for water.'

Anchorage may be had off this spring, within two cables of the shore, in 20 fathoms of water; but a much better place for a ship to lie is 2 miles farther south, off a low shingle beach—where it is not so deep, and the gusts that come down the mountains, when the wind is from the west, are not nearly so heavy as at the other anchorage.

A vessel can always find shelter from the N.W. winds on the south side of the island, in depths varying from 6 to 25 fathoms; these winds blow with the regularity of a 'trade,' from May to October, and the only precaution to be kept in mind in choosing an anchorage is to avoid fixed kelp. From October to May the winds are generally light and the weather delightful. Occasionally a strong 'norther,' or a light S.E. gale, blows the first part of the winter, and strong gales from the N.W. again set in about the 1st of May.

It is said by those well versed in such things, that there is every indication of extensive mineral deposits, in the shape of quartz rock and copper, scattered over many parts of Cerros island. Whether they really exist there remains to be proved."

San Benito Islands.—Nearly 20 miles N.W. by W. from cape San Augustin, the south-western extremity of Cedros island, are the San Benito islands, a group of three small barren rocks, extending about 8 miles east and west, and one mile north and south. The westernmost is the largest; it is a circular, flat-topped island, about 200 feet high, with a mound in the centre about 650 feet high. At its north-east end is a low point running out a quarter of a mile to the westward. The middle island is low, and about two-thirds of a mile long, east and west. There is a narrow passage filled with rocks between this and the western island. The eastern island is about a mile long, north and south, and has a peak on its northern end about 500 feet high. There is a boat passage between this and the middle island, a quarter to half a mile wide, with several rocks, some above water. The islands are surrounded with kelp and detached rocks.

The geographical position of the summit of the largest (western) San Benito island, according to the observations of Com. Dewey, U.S.S. *Narragansett*, 1874, is lat. 28° 18' 8", long. 115° 38' 10".

There is anchorage south-east of the western island, in 12 fathoms, sandy bottom,

outside the kelp; and a good landing on the north-east side of the same island on a shingle beach northward of a red rock.

Two sharp pinnacle rocks, with only 6 feet water on them, are situated $1\frac{1}{2}$ miles W. by S. from the mound on the western island. They are about 80 feet apart N.E. and S.W.; the southern one about 80 feet and the northern one 10 feet in length on top, and 2 to 4 feet wide. The sea breaks on them in all weathers. At 100 feet east of the rocks the depth is 12 fathoms, and no bottom at 20 fathoms at any other place around them at the same distance.

Natividad Island.—From Morro Redondo the eastern point of Natividad island bears S. by E. $\frac{1}{2}$ E. $10\frac{1}{2}$ miles. There is a clear passage 8 miles in width between Cedros and Natividad islands, with 15 to 30 fathoms water (excepting the 5 to 10-fathom patch already alluded to). This passage is known as Kellet channel.

Natividad island is about $4\frac{1}{2}$ miles in length N.W. and S.E., and half a mile to a mile and a half in width, being widest at the south-eastern extremity. It is of moderate elevation, hilly, entirely barren, and surrounded with kelp. The highest part is near the western end, and is about 500 feet. This part is very rocky, having a reef running out, mostly under water, connecting it with an islet known as Maria rock. In fact, the channel is almost entirely surrounded by rocks above and under water.

E.N.E. from the southern part of the island is a square flat-topped rock, about 25 feet high, connected with the island by a reef, upon which the sea breaks continually.

Sail rock, 40 feet high, lies about 2 cables off the southern point of the island; off it a reef, on which the sea breaks occasionally, extends S. by W. half a mile.

Dewey Channel, between Natividad island and the mainland, is 4 miles wide. On the Natividad side there is much foul ground. A 3-fathom shoal, having 9 and 10 fathoms around, lies about $1\frac{1}{2}$ miles East from the south end of Natividad island. The sea breaks over this shoal only at long intervals in fine weather. A large field of kelp stretches off for several miles southward of point San Eugenio.

In using this channel, keep about a mile and a half from the point, until the kelp-patch is passed, then steer parallel with the coast.

SEBASTIAN VISCAINO BAY.—At point San Eugenio, already described (page 169) the coast suddenly turns eastward and after continuing in that direction many miles, gradually curves northward and north-westward and forms with Cerros island the great bay of Sebastian Viscaino, the entrance to which, between Cerros island and the north-east coast of the mainland, is about 50 miles in width.

The coast immediately eastward of point San Eugenio is rocky and mountainous, the mountains being near the shore. As the entrance to Scammon or Ojo de Lievre lagoon, about 40 miles eastward of the point, is approached, the coast gradually becomes lower and more sandy. The mouth of this lagoon is in about lat. $27^{\circ} 54'$, long. $114^{\circ} 16'$, it is recognised by white sand-bluffs on each side, 80 to 40 feet high. Extensive shoals extend off hereabout in a northerly direction, only 4 fathoms water being found 6 miles from the land.

From the mouth of Scammon lagoon the coast, consisting of a low sand-beach, with numerous hillocks 10 to 30 feet high, trends N.E. by N. 15 miles to the entrance of the Black Warrior lagoon. Shoals make off for a long distance north-west of the

entrance of the lagoon, the depth at 5 miles from the land being only 4 fathoms, with heavy breakers within. Another lagoon, known as the Manuela or upper lagoon, lies a few miles farther northward, having its entrance about 4 miles southward of Lagoon head.

Lagoon Head, in about lat. $28^{\circ} 14'$, long. $114^{\circ} 5'$, is a lofty headland; its highest peak is 474 feet above the sea, and visible at a distance of 30 or 40 miles in clear weather. When viewed from a distance of a few miles at sea it looks like an island, as the low land inside it cannot be seen.

From Lagoon head the coast turns abruptly to the eastward about 2 miles, sweeping gradually to the southward, and forming a small open bay, which affords good anchorage anywhere near the land, in 3 to 9 fathoms, sandy bottom.

High land extends about 2 miles east to a point near the northern end of the upper lagoon; thence, to the eastward and southward, extensive plains and marshes stretch away to the great lagoons, high mountain-ranges being visible in the interior.

The following description of the lagoons in Sebastian Visentino bay is extracted from the *Nautical Magazine*, 1860;—

"The coast of Lower California, from San Geronimo island to the great lagoon, trends U.E., presenting a nearly unbroken range of rugged mountains, scantily clothed with cedar trees, but in many places barren of all verdure; and, to judge by the appearance from seaward, unfit for human habitation. For about 80 miles the sierra closes on the sea, throwing out bold rocky promontories, offering no shelter for vessels, although promising deep water close in shore. Here and there long stretches of white sandy beach appear, on which the surf rolls heavily. Following the coast down to where Cerros island bears about S.W., a headland will be observed in the main land, known by the name of Lagoon head, from rising abruptly out of a low country which is passed after leaving the mountain ridges already mentioned. This headland is high and black like a hummock, but appears to have no other elevations inland from it.

Immediately southward of this is a lagoon about 10 miles long by 7 broad, to which no name has yet been given. It was entered by whale-boats, and partially explored; but there is not depth enough for a ship to pass over the bar, on which a heavy surf breaks in westerly winds. The land subsides again into a low marshy country from Lagoon head for about 12 miles, when, in following the coast to the S.E., the mouth of a second and larger lagoon is opened. This is about 15 miles long by 8 wide, and has depth of water sufficient to float a ship; but the bar is very dangerous. It is known as the San Domingo lagoon. Navigators will be very apt to mistake this or the first one for the big or whaling lagoon (that named Ojo de Lievre); but care should be taken to pass by two entrances before standing in for the land. The whaler *Black Warrior* was lost at the mouth of this second lagoon, while attempting to enter, having mistaken it for the large one, which is still farther southward. On leaving Lagoon head, a ship may stand along at a distance of 6 miles from the beach, keeping in about 7 fathoms water.

After passing the second lagoon, about 10 miles from the head, the outer breakers at the entrance of the big lagoon may be plainly seen, as well as those on the bar, stretching 4 or 5 miles seaward; keeping inside of these the inner breakers will appear

in shore, and the channel lies midway between the two lines. This channel may be plainly seen, it opens gradually, shoaling until on the bar, which has 2 fathoms at low water and 8 at high water spring tides, and is from half a mile to 1 mile wide. The bar is about a quarter of a mile across, and when passed, the water rapidly deepens to 4, 5, and 6 fathoms. The entrance is then plainly visible, formed by two sandheads, about 80 feet in height. The deepest water is midway between the heads, after passing which the right hand shore should be kept aboard, and with the lead going there will be no difficulty in running into the lagoon.

This lagoon (Ojo de Lievre) was first entered by Captain Seammon in the spring of 1856. While whaling in Magdalena bay, a Mexican informed him of it, but never having been there, he was unable to describe its situation, although he judged from the low character of the country and the receding of the mountains in that direction, that the lagoon must be there. He accordingly set out on an exploring expedition, and first struck the small or northern one, which with the next, he partially explored, and was three days getting down to the big one, the approach to which looked very dangerous to a stranger. Having sounded the channel with his boats, he took his ship in. The explorations which have thus far been made lead to the supposition that these three lagoons were, at one time, a single body of water, and it is thought that, owing to the marshy character of the country, there may still be, during the rainy season, communication by sloughs or branches; but this is not known. The mountains, with their serrated peaks, traversing the Lower California peninsula, generally close with the coast, either within a few miles of the beach, or from jutting headlands washed by the waves of the ocean. The chain opposite to where the lagoon is, turns inland about 20 miles, opening a sort of amphitheatre, forming the bed of the lake, which is filled from the ocean, and the only inlet or outlet to which, thus far discovered, is the entrance already described. A small space of rising land intervenes between the western border and the foothills of the mountains, which are wooded in a few places, but appear generally to be sterile and valueless.

Around the borders of the lagoon are ranges of sand hills, extending in every direction, being apparently the collection of ages, drifted in from the ocean. This feature gives to the vicinity an aspect somewhat similar to that of the ocean beach opposite San Francisco, but without the rocks and headlands. These sands are ever moving and changing, in consequence of being thus driven by the fierce ocean winds. A boat which was left for a few days near the southern border of the lagoon was completely filled with sand, and would, in another week, have been entirely hidden from sight by it. Of course no trees nor herbage of any kind exists there, nor can any kind of cultivation be carried on. Changes in the face of the country are going on constantly. Logs of redwood, 8 or 4 feet in diameter, are even found half covered over by sand, and sometimes several miles from the water. These are evidently of Oregon growth, and have either been thrown into their present position by the surf, in some tremendous storm, or being once lodged on the beach, the sands have encroached on the water, leaving the logs far inland in the course of time. Their presence is accounted for by currents setting down from the northward. Fresh-water and wood are very scarce, and should an unhappy wayfarer chance to get lost in these trackless wilds, starvation would be inevitable. Several instances of this are very well known.

The lagoon from its entrance expands at once into a vast sheet of water. In every direction nothing is to be seen on the shore but scrub bushes and stunted grass. To the southward, a small lagoon, about 8 miles in extent, is connected with the larger one, and is navigable. It is known as *fort Lagoon*, but whales seldom go into it. The lagoon contains several islands, covered with stunted grass and weeds, with the exception of two, which are supposed to contain guano, although this conclusion is not yet well established. The distance from the bar to the western border is between 30 and 40 miles, but counting the northern lagoons already described, and which are believed to have been at one time a portion of the main one, this body of water would be upwards of 70 miles in extent. The breadth is between 20 and 30 miles. In every part, except close to the shore, may be found from 2 to 5 fathoms, and good anchorage everywhere."

Santa Rosalia Bay, about 20 miles northward of Lagoon head, affords good anchorage with northerly winds. The point forming the southern limit of the bay is low and dangerous, rocks and shoals making off from it at least a mile; its approximate geographical position is lat. $28^{\circ} 34'$, long. $114^{\circ} 7'$.

A short distance northward of Rosalia point is a small bare rock about 40 feet high known as *Elide island*. There is a little guano on it, and it is covered with sea-fowl and seals. It lies about half a mile from the mainland, and there is an anchorage on its south-east side.

From Rosalia point to Maria point, 22 miles N.W. $\frac{1}{4}$ W., the coast is moderately low, with high ranges of hills a short distance back. It is a succession of points with shallow bays intervening.

Maria Point is low and rocky, with sand-hills rising to a height of about 80 feet a quarter of a mile inland; when seen from southward it appears as a dark low point, with a red cone (*Cone point*) above it. Its approximate geographical position is lat. $28^{\circ} 54' 30''$, long. $114^{\circ} 29'$.

Playa Maria Bay.—This bay lies to the south-eastward of Maria point, between it and Black point; it is about 6 miles in width and 2 miles in depth. Black point is a low dark rock, backed by white sand a short distance inland.

The land about the bay is low and sandy, and as barren as most of this coast. A hill, known as *Station peak*, 256 feet high, is situated near the head of the bay.

There is good anchorage in 6 fathoms, about a mile from the beach, where a ship may find shelter from the northerly coast winds. It is high water, full and change, at 9h. 20m.; springs rise 7 to 9 feet.

Cone Point $4\frac{1}{4}$ miles N.W. by W. $\frac{1}{4}$ W. from Maria point, is a remarkable red cone 200 feet high, with many detached and outlying rocks extending of about half a mile to the southward. When first seen from the northward it looks like an island. False bay lies between Cone and Maria points.

Blanco Point, $17\frac{1}{4}$ miles north-westward of Cone point, is a perpendicular sand-cliff about 100 feet high with the coast range just behind. The intervening coast is a succession of points and bays, one of which, Blanco bay, affords good anchorage with a northerly wind. In about lat. $29^{\circ} 11'$ is a rock, 20 feet high, situated close to the shore.

Canoas Point is about 24 miles W.N.W. from cape Blanco; it is a perpendicular

sand-bluff about 224 feet high. The coast between these points recedes about 5 miles, forming an extensive open bay, known as Canoas bay.

San Antonio Point, in about lat. $29^{\circ} 45'$, long. $115^{\circ} 40'$, is distant about 85 miles W.N.W. from Canoas point. The intervening coast consists of sand-bluffs, and is rather lower near San Antonio than at Canoas point. High table-lands rise immediately from the coast to a height of 1000 to 2000 feet.

Sacramento Reef, on which the P.M.S.S. Co. steamer *Sacramento*, was lost in 1878, bears S.W. by W. $\frac{1}{2}$ W. $8\frac{1}{2}$ miles from point San Antonio. It is about a mile in length, north-west and south-east, and half a mile wide. The approximate geographical position of the centre of the reef is lat. $28^{\circ} 44'$, long. $115^{\circ} 44'$. There are several rocks awash and above water, and the sea constantly breaks over them. The reef is surrounded by thick kelp, which extends nearly to San Geronimo island ($8\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from it) and about half way to point San Antonio, between which and the reef there is a passage with 6 to 12 fathoms water. Although there is shoal water for many miles southward of the island, there are no indications of rocks or reefs; still there may be many hidden dangers, and a vessel should not approach this part of the coast without using great caution and sounding before running through the thick kelp.

San Geronimo.—This islet lies about $5\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from point San Antonio, is about a mile in length, N.N.E. and S.S.W., and a third of a mile wide. Seen from northward it shows three hills of moderate elevation, the highest 170 feet, and it is low at both ends. The island is covered in many places with a mixture of sand and guano. It is surrounded by kelp and outlying rocks, except on the south-east side at the foot of the highest peak, where there is a small shingle-beach.

There is a passage about 4 miles in width between the island and the mainland; but it should not be used, except in cases of great emergency, as kelp covers nearly the entire space, and no doubt covers many hidden dangers.

The geographical position of San Geronimo island, according to the observations of Com. Dewey U.S.S. *Narragansett* 1874, is lat. $29^{\circ} 47' 5''$, long. $115^{\circ} 47' 44''$.

Rosario Bay.—The coast between point San Antonio and point Baja, 14 miles N.W. $\frac{1}{2}$ N., recedes a few miles and forms near the latter point an open bay named Rosario. Here vessels may find protection from the coast winds. The country about the head of the bay near point Baja is fertile and cultivated, and supplies of vegetables, fresh beef, and water may be obtained there. The old mission of Rosario is a few miles inland.

There is a reef and line of kelp extending a short distance southward from point Baja, and vessels entering the bay of Rosario should give it a good berth.

Cape San Quentin is distant $25\frac{1}{2}$ miles N.W. by N. from point Baja. The intervening coast is for the most part low and sandy, especially in the vicinity of San Quentin bay; there are high hills a short distance inland.

Mount Mayo, the highest part of the cape, is 210 feet in height, and is in the centre of the peninsula forming the western side of port San Quentin. Entrada point, the easternmost point of the peninsula, is low and rocky but may be approached within a quarter of a mile. Thence westward the coast is of similar character with numerous projecting points and outlying rocks over which the sea breaks heavily. Reef point, the westernmost point of the head, is dangerous to approach, as numerous rocks, above and under water, lie off it.

Port San Quentin.—The land about port San Quentin is low and sandy, and entirely without vegetation. The five remarkably placed mountains of volcanic origin, on the north side of the bay, caused one of the early navigators to call this the "Bay of Five Hills." These mountains are from 800 to 1100 feet high, except the western end previously mentioned, which has an altitude of 460 feet.*

No vessel drawing over 12 feet should attempt to enter this bay without either buoying the channel or sending a boat ahead, as the channel usually shifts with every south-east gale, and is narrow and tortuous with not over 8 fathoms on the bar. For small vessels it is a most excellent harbour, affording perfect protection from every wind.

To enter the port, steer for Entrada point (the last rocky point passed in entering), giving it a berth of a quarter of a mile; then steer N.W. about 4 cables, until you pass a sand-spit making out between Entrada and Sextant points; then head up for the latter point W. by N., passing it close to, as the channel at this place is very narrow.

Sextant point is low and sandy. After passing it, follow the shore-line, and anchor in 5 or 6 fathoms half a mile inside the point.

The approximate geographical position of Entrada point, on the western side of the entrance to San Quentin bay, is lat. $30^{\circ} 22'$, long. $115^{\circ} 57'$.

San Martin Island.—About 10 miles north-west of cape San Quentin and $2\frac{1}{2}$ miles off the coast (which is here cliffy, 200 feet high) is San Martin island; there is a clear passage between it and the mainland, carrying 10 to 15 fathoms water, apparently free from all dangers:

San Martin island is of volcanic origin, nearly circular in form, and is about 2 miles in extent in an east and west direction. It is quite barren, producing nothing but the prickly pear, and a little stunted brush growing among the rocks. The highest peak is 500 feet and is the crater of an extinct volcano, its diameter being 350 feet and its depth about 40 feet.

There is good anchorage on the south-east side of the island, off the mouth of a small lagoon; and a better one on the north-east side, in a snug little cove, named Hassler cove, where a ship may anchor in 8 or 9 fathoms protected from all winds except those from north. The eastern side of the cove is formed by huge boulders which extend off to the northward, making an excellent breakwater.

The geographical position of the anchorage on the north-east side of San Martin island, according to the observations of Com. Dewey U.S.S. *Narragansett*, 1874, is lat. $30^{\circ} 29' 4''$, long. $116^{\circ} 6' 30''$.

Beno Rock lies S. $\frac{1}{2}$ W. $8\frac{1}{2}$ miles from the eastern end of San Martin island. It has from 9 to 12 feet water on it with 5 fathoms close to, and no bottom at 17 fathoms 2 cables from it. The sea does not break on it in moderate weather.

The coast between San Martin island and Reef point (the western point of cape San Quentin) is formed of low sand-hills, except at about 5 miles to the northward of the point where one of the "Five Hills" borders directly on the sea.

* This port is of no commercial importance, and is very rarely visited. It was surveyed in 1839 by Captain Sir E. Belcher, R.N., and a plan (No. 1924) of it was subsequently published.

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San Ramon Bay.—Four miles northward of San Martin island is the bay of San Ramon, formed by a slight indentation in the coast-line, which is here of low sand-hills 50 to 100 feet high. At the southern extremity of this bay, extending 2½ miles, is a remarkable perpendicular cliff of dark rock 150 to 200 feet high.

The coast northward of San Martin island for about 20 miles is low and sandy; the water shoal, with heavy surf off the part northward of Ramon bay. Thence to cape Colnett the coast is skirted by numerous fields of kelp making off 3 or 4 miles from the land.

Cape Colnett, distant 80 miles N.W. ¼ N. from San Martin island, is a remarkable headland, nearly semicircular in form, with perpendicular cliffs 100 to 350 feet high, of a dark-coloured rock (nearly black), on a bed of light sandstone, the coast retaining the same appearance for about 10 miles northward. The cape bearing E.N.E., distant 7 miles, shows dark with yellow sand beyond.

Colnett Bay.—From cape Colnett the coast trends north-eastward for a short distance, forming Colnett bay, where good anchorage may be found in 6 to 8 fathoms, sandy bottom, sheltered from northerly winds.

The geographical position of the head of Colnett bay, according to the observations of Com. Dewey, U.S.S. *Narragansett*, 1874, is lat. 30° 57' 36", long. 116° 17' 22".

Point Soledad is distant 41 miles N.W. by N. from cape Colnett. The coast between these points recedes several miles and is generally low, rising rapidly inland. Point Soledad is low and rocky, rising abruptly to a height of 500 feet. Southward of the point, near two houses, there is good anchorage in from 8 to 10 fathoms, sheltered from the coast wind.

Soledad rocks, one mile west of the point, are of small extent. They are 20 feet high, and surrounded by kelp. There is a clear passage between them and Soledad point, keeping clear of the kelp on both sides.

Point Banda, 12 miles N.W. ¼ N. from point Soledad, is the extremity of a promontory forming the southern side of Todos Santos bay. It is high, the highest peak being 500 feet, with outlying rocks extending three-quarters of a mile in a north-westerly direction.

The coast between point Soledad and Banda point is high and precipitous, with deep water close-to. There is a whaling-station about 3 miles eastward of Banda point, in the bay, with a good anchorage sheltered from all winds, except those from westward.

The channel between point Banda and Todos Santos islands is about 8 miles wide and free from all dangers, except the outlying rocks off point Banda mentioned above.

Todos Santos Islands, distant about 8 miles N.W. ¼ W. from Banda point, front the bay of the same name. They extend about 2 miles in a north-west and south-east direction. The western one is about one mile in length, east and west, a quarter of a mile wide, and 80 to 60 feet high; the eastern one is about the same length, north-west and south-east, half a mile wide, and 250 feet high. Both are surrounded by detached rocks and kelp; there is a boat-passageway between them.

Todos Santos Bay.—Cape San Miguel, the northern limit of Todos Santos bay, is high and bold. Thence to Encenada point, a distance of about 6 miles E. by S., the coast is bold, with cliffs 50 to 200 feet high. There is a large field of kelp near Encenada point, with 10 fathoms water at its southern end.

From Encenada point, which is 870 feet high, the coast recedes in a north-easterly direction, forming a snug little anchorage, where vessels may anchor in 3 to 7 fathoms, sandy bottom, perfectly sheltered from all winds, except those from the south-west.

From the west end of the sand-beach, where it joins the bluffs of Encenada point, the land sweeps around to the southward and westward to point Banda, which is $8\frac{1}{4}$ miles distant, and is the southern limit of Todos Santos bay. The land at the head of the bay is low and sandy, and the soundings, at the distance of one mile, are 3 to 5 fathoms.

The geographical position of the anchorage at the north-east corner of Todos Santos bay, according to Com. Dewey, U.S.S. *Narragansett*, 1874, is lat. $31^{\circ} 51' 26''$, long. $116^{\circ} 37' 55''$.

From cape San Miguel the coast trends N.W. by W. 12 miles to point Sal-si-Puedes, and consists of sand-bluffs and rocky cliffs about 50 feet high, with high hills just back; the mountain range a few miles inland presents the appearance, however, to one a few miles at sea, of being immediately on the coast.

Cape Descanso is about 16 miles N.W. $\frac{1}{2}$ N. from point Sal-si-puedes. The coast between these points is generally sandy, with an occasional rocky cliff, and mountains rising a short distance inland.

Southward of Descanso point the land recedes somewhat, forming Descanso bay. Sugar-loaf rock in the middle of the bay bears S.E. $\frac{1}{2}$ E. $2\frac{1}{4}$ miles from Descanso point; it is a small low rock about 15 feet high, and apparently the only danger hereabout. There is an anchorage southward of the rock which is often used by the small coasters.

Boundary Monument.—About $16\frac{1}{4}$ miles N.W. by N. from Descanso point is a table bluff rising from the low land south of San Diego bay, upon which is a monument marking the western point of the boundary between Mexico and the United States. It consists of an obelisk of white marble, about 20 feet in height, resting upon a pedestal. It stands near the edge of the bluff, about 200 yards from the shore, and its position is lat. $32^{\circ} 31' 58''$, long. $117^{\circ} 6' 11''$. Thence the coast is low and flat, running N. by W. for about 7 miles, and then curving gradually westward until it is nearly East and West at the entrance of San Diego bay. In the interior are high mountains.

Between Descanso point and the monument the coast is generally bluff, 50 to 80 feet high, with a range of hills about 500 feet high a few miles inland and a range of mountains at the back of them. One of these, the Table mountain, 2800 feet high, is remarkable; another, a triple-peaked mountain a few miles south, is 2700 feet high.

CORONADOS ISLES.—These rocky islets, belonging to Mexico, lie about 7 miles from the coast; the largest of them is in lat. $32^{\circ} 28' 46''$, long. $117^{\circ} 18' 21''$. They form a group of high, bold, and abrupt rocks and islets, of which the largest (15 miles S. by E. from point Loma, San Diego) is about $2\frac{1}{4}$ miles in length by a third of a mile in breadth, lying in a N.W. and S.E. direction. It is a wedge-shaped mass, 800 feet high, entirely destitute of trees. At about a quarter of a mile eastward of the islet there is anchorage; and, there is but one landing place upon it, which is difficult.

On the west and north-west sides of the large islet, half a mile distant, are two

smaller islets, or rather masses of rock about 50 feet high, and destitute of vegetation. Excellent anchorage is said to exist in the vicinity. Another islet, the outermost, lies N.W. by W. distant $2\frac{1}{2}$ miles from the large islet; it is a huge barren rock, about a mile in extent, with a very sharp summit.

Point Loma and Light.—Point Loma is the termination of a remarkable narrow spur of coarse, crumbling sand-stone, which rises south of Puerto Falso, or False bay, and west of the town of San Diego, to the height of 300 feet, and after stretching south for about $5\frac{1}{2}$ miles; gradually increasing in height to 422 feet, terminates very abruptly. It is covered with coarse grass; cacti, wild sage, and low bushes. Upon point Loma is a lighthouse, consisting of a dark grey tower, from which is exhibited a *fixed white* light, at 492 feet above the sea, visible 25 miles. Its geographical position is lat. $32^{\circ} 40' 14''$, long. $117^{\circ} 14' 88''$.*

SAN DIEGO.—The port of San Diego is formed on the *west* side by a bold projecting point of land, of which the southern extremity is named point Loma; and, on the *east* side by low flat land covered with thick bushes and grass, named the 'island', although it is really a peninsula—being connected to the eastern shore by a very low and narrow strip of beach.†

Next to that of San Francisco, no harbour on the Pacific coast of the United States approximates in excellence that of the bay of San Diego. It is readily distinguished, easily approached, and a depth of 22 feet can be carried over the bar, which is three-quarters of a mile east of the southern extremity of point Loma, and between it and the tail of the Zuniga shoal. The width of the bar is about 8 cables from the outer to the inner 5-fathom lines.

Vessels coming from north-westward make the ridge of point Loma as a long, flat-topped island, when about 25 miles distant. This appearance is occasioned by the bay to the south-west, by the low land to the north-east, and by the Puerto Falso at the north.

A thick field of kelp lies along the western shore of point Loma; the inner edge being but one mile off shore, and having a breadth of half a mile. The outer edge marks the line where the depth of water suddenly changes from 20 to 10 fathoms. The field commences off the bar at the entrance to False bay, and stretches southward $2\frac{1}{2}$ miles south of point Loma. Approaching the south end of Loma, along the outer edge of the kelp, pass through a partial break in it, and when the point bears N.E. by E., distant $1\frac{1}{2}$ miles; keep along the northern edge of the kelp in $4\frac{1}{2}$ fathoms, and about half a mile from the point.

* The longitude above given is that adopted by the United States Coast Survey, 1879. Com. George Dewey, U.S.N., 1874, assumes the longitude of point Loma to be $117^{\circ} 9' 40''$, and all his positions on the coast of Lower California given in this publication, are dependent on that assumption.

† See the plan of the harbour of San Diego on the chart of the coast of California, issued by the publishers of this work (Messrs. IMRAY AND SON). In this chart are inserted plans of most of the harbours on the coast between Cape Corrientes and San Francisco. The port of San Diego is fronted by a bar which is tolerably permanent in its general features; the instructions here given for it are from the United States Coast Survey Report for 1862.

As soon as the point is passed, a long, low beach of shingle is opened, making out from the east side of the point and forming a natural breakwater, formerly called Punta de Guiranas * by the Spaniards, but now designated as Ballast point.

Round up gradually until Ballast point is brought in range with the easternmost house of La Playa (distant one mile from Ballast point and on the same side of the bay), and be careful not to open more of the village, as the shoal called Barros de Zuningo † stretches south from the east side of the entrance, parallel to the ridge of point Loma, and distant only three-quarters of a mile from it. Between point Loma and this shoal runs the channel, which is less than half a mile wide within the 8-fathom lines. With the least swell the breakers show the position and extent of the shoal, and at low tides part of it is bare. It has been said that a rock, having but 5 or 6 feet of water upon it, lies in the channel; its position being marked by a patch of kelp, which is, however, torn away in heavy weather. The pilot boat *Fanny* reported being upon it in 1851, but the examinations of the Coast Survey have developed no such danger, and the report has been generally discredited.

During the summer keep as close to point Loma as the draught of the vessel will permit, and lay on the wind up to Ballast point, off which 4 fathoms can be carried within a ship's length, with 10 fathoms in mid-channel, and a very strong current on the ebb and flood tides; the former setting over the Zuninga shoal. After passing Ballast point steer for La Playa, and anchor anywhere in from 4 to 10 fathoms, with good holding-ground. Inside the point, and about 250 yards N. by W. from it, is a shoal having only 12 feet water upon it, in a line from Ballast point to the westernmost house at La Playa; it is a quarter of a mile long. The shoals on the starboard hand, after entering, are plainly in sight, except at very high water; the channel, however, is buoyed, and cannot be missed. From La Playa to New San Diego, 4 miles distant, the channel curves to the right and contracts, but about 6 fathoms water may be carried that far. A mile or two beyond the town the bay becomes shoal and filled with flats, yet a very narrow 8-fathom channel runs close along the eastern shore, nearly to the head of the bay.

Coming from the south, run for the extreme end of point Loma until Ballast point and La Playa are in range, as before, and follow the foregoing directions.

When inside the harbour vessels are perfectly safe, but during very heavy southerly weather the kelp is said to drive in such masses as to make vessels drag their anchors. We have never known such a case, and doubt if a vessel with good ground tackle and proper attention would suffer from this cause. Certainly there is not reach enough for the wind to raise a swell, and the holding ground is excellent. In heavy south-east weather the sea breaks over Ballast point.

From Ballast point the bay runs about north for $1\frac{1}{4}$ miles; thence it curves gradually to the eastward for 8 miles to New San Diego; thence to the head of the bay, south-east, 7 miles. The average width of the bay after passing La Playa is $1\frac{1}{4}$ miles, but

* Or Punta de los Gujarras.

† Named by Visosino in 1602. Don Gaspar de Zuniga, Count de Monterey, despatched the expedition.

at New San Diego, after contracting to a trifle over half a mile, it again expands to about 1½ miles, with low shores and extensive marshes and flats.

Tides.—At La Playa the corrected establishment is 9h. 38m. The mean rise and fall of tide is 8·7 feet; of spring tides 5 feet; and of neap tides 2·3 feet. The mean direction of the flood is 6h. 25m.; of the ebb 6h.; and of the stand 0h. 80m.

The following remarks on San Diego harbour are by Mr. Davidson, Chief of the U.S. Coast Survey on the Pacific Coast (1871).

“There is a depth of 22 feet water on the bar at the mean of the lowest low waters. The average rise and fall of tide is 8·7 feet. The average rise and fall of spring tides is 5·0 feet; of neap tides 2·3 feet. The width of the channel over the bar, carrying the foregoing depth, is about 600 yards; the distance across the bar, between 100 and 200 yards.

San Diego compares very favourably with other harbours on this coast. On San Francisco bar there is a depth of 5½ fathoms; on Humboldt bar, generally over 8 fathoms, but sometimes not over 15 feet; on the Umpqua bar, 12 to 18 feet; on Coos Bay bar, 7 to 12 feet; on the Columbia river bar, 4½ fathoms; on Shoalwater Bay bar, 4½ fathoms. All these bars change much, except that of San Francisco; and although the Columbia River bar has more water than that of San Diego, its advantages are partially counteracted by the frequently heavier swell, and the greater difficulty of running in by the landmarks.

The depth of water on San Diego bar compares favourably with the depth on the entrances to Atlantic harbours. Boston has about 18 feet; New York, 29½; Philadelphia, 18½; Charleston, Mobile, and New Orleans, less than 18 feet.

There is a noteworthy fact in relation to the depth of water on the bar of San Diego bay; a comparison of the surveys of Dalrymple, in 1782, and Vancouver, in 1793, and the last United States Coast Survey examinations, shows no change to have taken place since the former date.

The bottom is uniformly good. No rocks have been discovered in the bay or approaches. The position of San Diego bay with relation to point Loma is such that there is rarely much swell on the bar; in summer there are not many days of heavy S.E. weather. As a rule there is less swell on this bar than on any other bar on the Pacific coast.

I consider the approaches, the channel, and the facilities of entering and leaving, good, at all ordinary seasons, for all vessels not drawing over 20 feet of water, and at high water for vessels drawing 22 feet.

Large vessels can go about 7 miles up the bay—reckoning from Ballast point—with an average width of channel of 4 cables between the 4-fathom lines at low water. This indicates sufficient capacity to accommodate the wants of a large commerce.

The course of the channel within the bay is a regular curve, and buoys are needed on each side of the channel, from La Playa to Kimball's wharf.

There is less rain, fog, and thick haze, and more clear weather in this vicinity than at all points to the northward, and the entrance is less difficult to make and enter on that account.” (*Mer. Mar. Mag.*, 1871, p. 232).

Captain Sir E. Belcher, R.N., has observed “Port San Diego, for shelter, deserves

all the commendation that previous navigators have bestowed on it, and with good tackle, a vessel may be perfectly land-locked. The holding ground is stubborn, but in heavy southerly gales I am informed anchors 'come home,' owing to the immense volume of kelp driven into the harbour. It was stated to me by an old sailor in this region, that he has seen the whole bank of *fucus giganteus* (which comprises a tongue of 8 miles in length by a quarter broad) forced by a southerly gale into the port. This, coming across the bows, either causes the cable to part, or bring the anchor home. No vessel, however, has suffered from this cause. The chief drawback is the want of fresh-water, which, even at the presidio, 8 miles from the port, is very indifferent."

Commander Wilkes, U.S. Navy, observes as follows—"Port San Diego is of considerable extent, being, in fact, an arm of the sea. It is 10 miles long, and 4 miles wide, and, from being land-locked, is perfectly secure from all winds. The entrance is narrow and easily defended, and has a sufficient depth of water, 20 feet at lowest tide, for large vessels. The tide rises 5 feet. The tongue of kelp off the entrance of the bay must be avoided by large vessels, but small vessels may pass through it with a strong breeze. During gales, this kelp is torn up and driven into the bay, where it becomes troublesome to vessels by the pressure it brings upon them, either causing them to drag their anchors or part their cables.

There are many drawbacks to this harbour; the want of water is one of them, the river which furnishes the mission with water disappearing in the dry season before reaching the bay; and, the surrounding country may be called a barren waste of sand-hills. The town is situated on the north side of the bay, on a sand flat 2 miles wide. The mission establishment is 7 miles from the town, up a valley to the north-east; and here, there is a good supply of water the year round. This river, in the rainy season, discharges a considerable quantity of water into the bay, bringing with it much sand, which has already formed a bar across a part of False Bay, rendering it useless, and well grounded fears may be entertained that it will eventually destroy this harbour also; this occurrence, however, may be prevented at slight cost.

The whole country around San Diego is composed of volcanic sand and mud, mixed with scoria. The land is unfit for cultivation, and covered with cacti, one of the many evidences of the poorness of the soil; this leaves the port of San Diego little to recommend it but the uniform climate, good anchorage, and security from all winds."

False Bay.—At the north end of the ridge of point Loma is an extensive shoal bay called Puerto Falso, or False bay. The bar at its entrance lies N. by W. $\frac{1}{4}$ W., distant $5\frac{1}{4}$ miles from the southern extremity of point Loma; and having but 8 feet of water, it can be crossed only in the smoothest weather. The entrance just inside the line of heavy breakers is about a quarter of a mile in width, but rapidly contracts to less than half that width. The northern point of this bay is about 2 miles in length, very narrow, and covered with low sand dunes. To the north and west of this the shore becomes compact and unbroken, except by the valleys of San Luis Rey and San Juan Capistrano.

From the southern extremity of point Loma the coast runs N. by W. for 22 miles; thence to the east point of San Pedro bay, N.W. by W. $\frac{1}{4}$ W. nearly 60 miles.

San Luis Rey.—In the above extent of coast occurs the mission of San Luis Rey, the largest in California, situated in about lat. $33^{\circ} 17'$, long. $117^{\circ} 29'$. It is in a part of

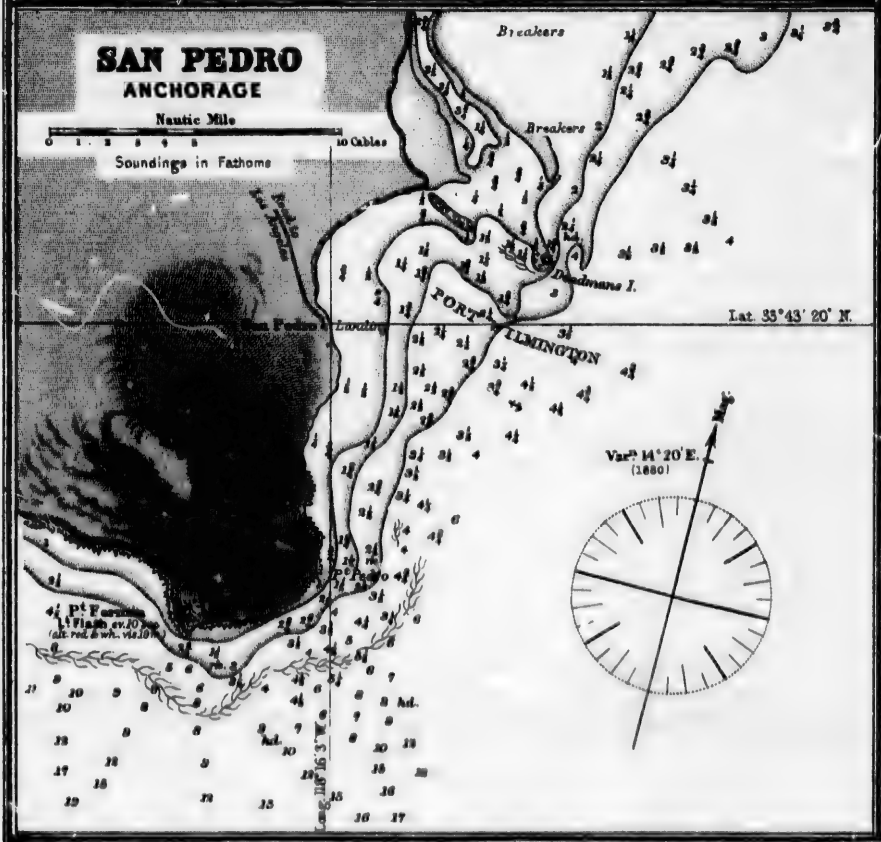
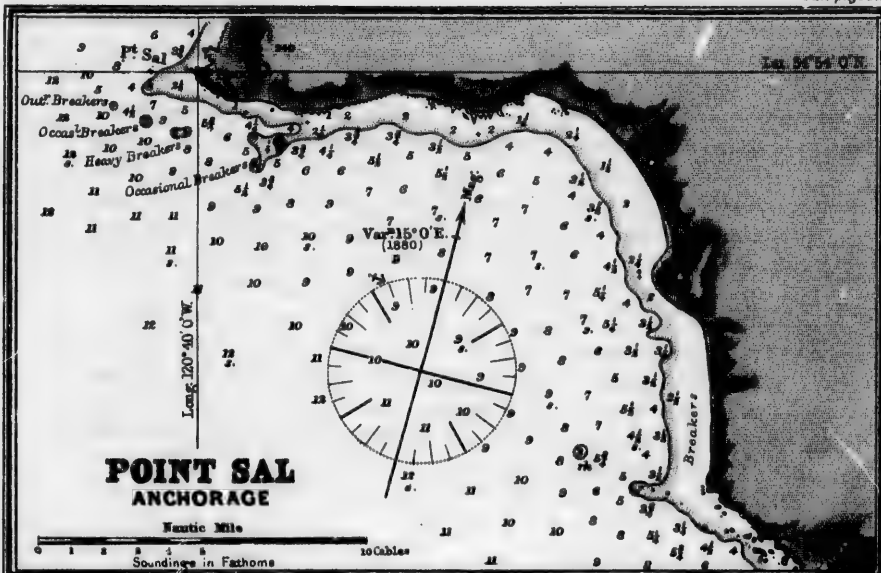
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the country unequalled for salubrity and productiveness, but the scarcity of rain is an insuperable drawback to its prosperity. The anchorage is very restricted and scarcely ever visited, as it is quite open to westerly and southerly winds.

San Juan Capistrano, a mission similar to that of San Luis Rey, is situated in about lat. $33^{\circ} 27'$, long. $117^{\circ} 48'$. The anchorage is rocky in soundings of less than 5 fathoms, and is unprotected: the landing is also bad. The bay is formed by a high cliffy head to the north-west, and terminates in a southerly direction in low sandy beaches. It is stated that when entering it from north-westward some care is required to give the bluff point a wide berth, because some dangerous rocks lie off it to a considerable distance.

Commander Wilkes, U.S.N., says "This bay has at its head a fertile valley, in which is situated the town and mission of San Juan. The bay is entirely unprotected and is a bad roadstead, the bottom being very foul inside of 5 fathoms, and the landing at times impossible, on account of the surf. It can be safely visited only during the fine season. Provisions and water are easily obtained; the latter from the mountain streams, which empty into the bay, and also enable the inhabitants to irrigate their lands by which mode of cultivation they are made extremely productive. The shore here becomes quite bold, making the communication to the northward by the land very inconvenient."

From San Juan Capistrano to point Fermin, on the west side of the bay of San Pedro, the distance is about 80 miles in a W. by N. $\frac{1}{2}$ N. direction; in the space between, known as the Bahía de los Tremblores, are several rivers (the Santa Anna, Bolsas, and San Gabriel rivers), also the landing wharf at *Anaheim*, a place rapidly rising in importance. The cliffs along this side of the coast are steep. Only very little water is to be obtained here, and the little that is required for the supply of the inhabitants has to be brought from a distance in the interior. San Pedro hill, over point Fermin, is 1600 feet high.

Point Fermin Light.—A flashing light is exhibited from a lighthouse on point Fermin, showing alternate red and white flashes at intervals of 10 seconds, each flash being followed by an eclipse. The light is 151 feet above high water and visible 19 miles. The tower, 60 feet high, is square, of a light buff colour; its geographical position is lat. $33^{\circ} 42' 19''$, long. $118^{\circ} 17' 37''$. Near the point is a rock with only 7 feet water over it.

SAN PEDRO.—This bay is formed on the west side by the high bold land of which point Fermin is the extremity, and on the east side by the low coast of the main land. It is open to all points from S.W., by the southward to S.E., and is consequently exposed to the full force of the winter gales; but during spring, summer, and autumn, it is an excellent roadstead. A little islet, named El Moro, lies half a mile from the beach, and has close to its east side a depth of 18 to 12 feet; between it and the shore there is no passage.

At about 20 miles in the interior, almost North from San Pedro, is the town of Los Angeles, which is the centre of an extensive grazing, agricultural, and grape growing country. The quantity of grapes, and fruits generally, shipped from San Pedro to San Francisco during the proper season, is very large.

During the year 1875 the exports of San Pedro amounted to 14,800 tons, among

which were 7,000 tons of grain, 1000 tons of fruit, and 1500 tons of wool. The imports amounted to 21,000 tons (exclusive of 12,000 tons for the railroad).

From point Fermin a line of bold bluff runs exactly north and south for about 2 miles, and averages 60 feet in height. Point Vincente, the western point of the high land of San Pedro, is also bold and has deep water in its immediate vicinity.

Vessels approaching San Pedro bay from *westward* through the Santa Barbara channel make San Pedro hill, as an island projected against the mountains to the southward and eastward. Approaching point Vincente, which is the south-west point of the hill, vessels can keep it close aboard, there being from 50 to 80 fathoms within a mile of the shore; round point Fermin within half a mile, in from 6 to 10 fathoms, and open the small island El Moro, run for that island, and when abreast of the landing (readily recognized by the houses on the bluff), about one mile north of point Fermin, anchor in 8 fathoms, hard bottom, at half a mile off shore. Vessels must anchor a mile off to get 5 fathoms.

Coming from the *southward* with north-west winds, beat in boldly until abreast of the landing; keep the lead going and anchor anywhere in its vicinity. Do not approach the low shore, to the north and east of El Moro, closer than 1 mile, at which limit 4 fathoms water will be found.

In winter, anchor farther out, and more to the southward, in order to be able to slip the cable and go to sea should a heavy south-easter spring up.

The waters of the lagoon, inside of the low sandy beach, and a mile or more northward of El Moro, find their principal outlet between that island and the bluff point half a mile west of it. The entrance is very narrow and crooked, and has or had two buoys, about 200 yards apart, to mark it. In 1859 it was stated that the "bar at the entrance to the creek remains about the same, as it did in 1852. At mean low water, at the half tides, only 2 feet of water can be carried over it." A small tow-boat, now, we believe, used for taking vessels to New San Pedro, situated about 8 miles inside the bar.

Wood and water are not readily obtained, and charges are high. The beef raised here is remarkably tough.

The position of the landing place, W.S.W. $\frac{1}{4}$ S. from El Moro, is considered to be lat. $33^{\circ} 48' 20''$, long. $118^{\circ} 16' 8''$. The corrected establishment of the port is 9h. 39m. The mean rise and fall of the tides is 3.7 feet; of spring tides 4.7 feet; and of neap tides 2.2 feet.

Santa Anna Lagoon.—At about 15 miles from San Pedro in an E. $\frac{1}{4}$ S. direction, is the Santa Anna lagoon which receives the waters of the Santa Anna river. When examined in 1861 it was found to be 5 miles long, and separated from the ocean by a narrow strip of low sand beach, over which washes the heavy swell from the north-west and south-east. The lagoon has a breadth of only a few hundred yards, and a mouth about 50 yards in width, with a narrow bar, upon which it is supposed 10 or 12 feet of water might be found at high tide. On this bar there is a very heavy break at all stages of the tide, rendering it dangerous to cross in boats of any kind. There is said to be no safe anchorage off the entrance, and the low straight beach, with a trend nearly east and west, affords no protection whatever. The San Pedro wind gap lies between San Pedro hill and the Sierra San Juan, to the south-east of the Santa Anna,

and the summer winds draw directly on the land, causing the north-west swell to roll upon the beach with great force. In winter the swell breaks square upon this whole line of coast, and would prevent any vessel passing into or out of the lagoon, or riding at anchor near it. In summer the Santa Anna is said to frequently dry up before reaching the lagoon. Santa Anna lagoon is also known as Newport bay.

Monica Bay.—From point Vincente the coast trends N. by W. $\frac{3}{4}$ W. 16 miles; thence W. by S. to point Dume, in lat. 84° , long. $118^{\circ} 42'$. The curve in the coast thus formed is known as Monica bay; at its head, in about lat. $34^{\circ} 2'$, long. $118^{\circ} 28'$, is a port bearing the same name. The trade at port Monica is small; in 1875 the exports and imports did not exceed 1000 tons respectively.

Point Dume rises into a dome-like form 202 feet high; the land immediately behind it falls away, so that in making it from westward it rises into view as an island close under the high mountains. Eastward of point Dume the mountains spring directly from the water.

From point Dume to point Hueneme the coast trends about W. by N. 22 miles; nearly midway between these points is Mugu point. Two miles westward of point Mugu is Laguna point, close under which is very deep water, the 10-fathom line running within 250 yards of the shore.

Port Hueneme.—This port lies, we believe, a short distance southward of the point of the same name. It carries on a considerable trade; in 1875 its exports figured at 10,500 tons.

Point Hueneme Light.—A *fixed* and *flashing* light is exhibited from a lighthouse on point Hueneme, at an elevation of 54 feet above high water, visible 12 miles. It shows a *fixed* light for *one minute*, followed by *six consecutive flashes* of 10 seconds duration each. The tower, 46 feet high, is painted light buff colour; its geographical position is lat. $84^{\circ} 8' 39''$, long. $119^{\circ} 12' 36''$. Being of slight elevation it shows very prominently against distant hills.

Between point Mugu and Buenaventura the coast is low, flat, and sandy, being the opening of the valley of Santa Clara, through which flows the Santa Clara river; this stream is nearly dry during the summer, and terminates in lagoons and marshes, but in the rainy season a volume of water is brought down having sufficient force to break through the narrow sand beach and flow into the ocean.

The eastern entrance to the Santa Barbara channel lies between the eastern end of Anacapa island and point Hueneme, which is about half-way between point Mugu and Buenaventura. From Anacapa, point Hueneme bears N.E. by N. $\frac{1}{4}$ N., distant $10\frac{1}{2}$ miles. Directly off this point is found a remarkable example of a sub-marine valley, commencing with a depth of 10 fathoms, 2 cables from the beach, increasing to 50 fathoms in about half a mile, and to 118 in less than two miles. Its general direction is South, with a width of a mile, and bounded on either side by depths of 12 and 15 fathoms. The best landing is directly on the point; landing in the bight eastward and leeward of it is impracticable.

San Buenaventura.—There is excellent holding ground off Buenaventura in 10 fathoms, but the landing is not good. The 3-fathom line lies about a quarter of a mile off-shore.

The mission of Buenaventura, situated at the foot of the dividing ridge of the valley of San Buenaventura and Santa Clara, about half a mile from the shore, was founded March 31st, 1782. Its position is about lat. $84^{\circ} 15'$, long. $119^{\circ} 15'$.

In 1875 the trade at San Buenaventura was as follows:—exports, 4,500 tons, imports 8,200 tons. The climate is temperate and the soil is remarkably fertile.

At about 15 miles westward of Buenaventura, on the coast, there is a rich deposit of sulphur, surface specimens of which have yielded 60 per cent. Around the locality are ashes and scoria. The ground is hot, and the gas emitted is almost suffocating.

SANTA BARBARA.—From San Buenaventura the coast trends nearly W. by N. 28 miles to Santa Barbara. This roadstead is open to all winds except those directly from northward; it is however somewhat sheltered by the islands Santa Cruz, Santa Rosa, and San Miguel from the swell sent on the coast by south-west winds. The depth at half a mile from the beach is 6 fathoms, and it is believed that no sunken dangers exist in the kelp which prevails in some profusion along the shore. When there is any swell the surf is very bad, not falling square on to the beach but cutting it at a sharp angle; at this time landing is difficult. There is anchorage within the line of kelp in about 4 fathoms, which is resorted to in summer, but not in winter, because at the latter season the gales detach and drive it shoreward in such vast quantities that, coming across a vessels' hawse, it helps to bring home her anchors. We believe that vessels generally put to sea when there are indications of a gale coming on from south-eastward.*

A dangerous sunken rock lies 12 miles westward of Santa Barbara and one mile off shore; it has only 15 feet water over it with a depth of 7 fathoms inside it.

The shore at Santa Barbara consists of a low sandy beach, which is terminated to the westward by a bold bluff, named point Castillo. The hill over this bluff is known as La Vigia. The usual landing place is at about half a mile eastward of point Castillo. The shore is low and flat as far as the town, three-quarters of a mile distant, but gradually rises to the mission, a prominent object about 2 miles inland.† The town is of considerable importance; it is situated in the midst of a rich agricultural district, running east and west at the southern base of the Sierra Concepcion, but of limited breadth. The trade with San Francisco is not extensive; but this being one of the greatest stock-raising districts on the coast, vast droves of cattle pass through and are sent to San Francisco and the mining districts. In 1875 the exports amounted to 2800 tons, and the imports to 5,500 tons. Regular communication by steamers and sailing vessels is maintained with San Francisco and other ports. Wood and provisions in abundance can be obtained here. Water is plentiful, but not so readily procured.

Light.—As a guide to vessels approaching Santa Barbara from westward and south-eastward, a lighthouse has been erected on the point, at about 2 miles south-westward from the landing place. It stands 188 yards from the edge of the bluff, and shows a *flashed white*, light at 180 feet above the sea, visible 17 miles. Its position is considered to be lat. $84^{\circ} 28' 44''$, long. $119^{\circ} 48' 16''$.

If approaching Santa Barbara from *westward* and *south-westward*, the hill La Vigia

* See the plan of Santa Barbara on the chart of the coast of California, published by Messrs. IMRAY AND SON.

† This mission is about 200 feet above the sea. It was founded December 4th, 1786, and soon became one of the largest and best establishments of the kind in California, and in the gardens attached to it the grape and olive were cultivated with great success.

SANTA

0 1
Sound

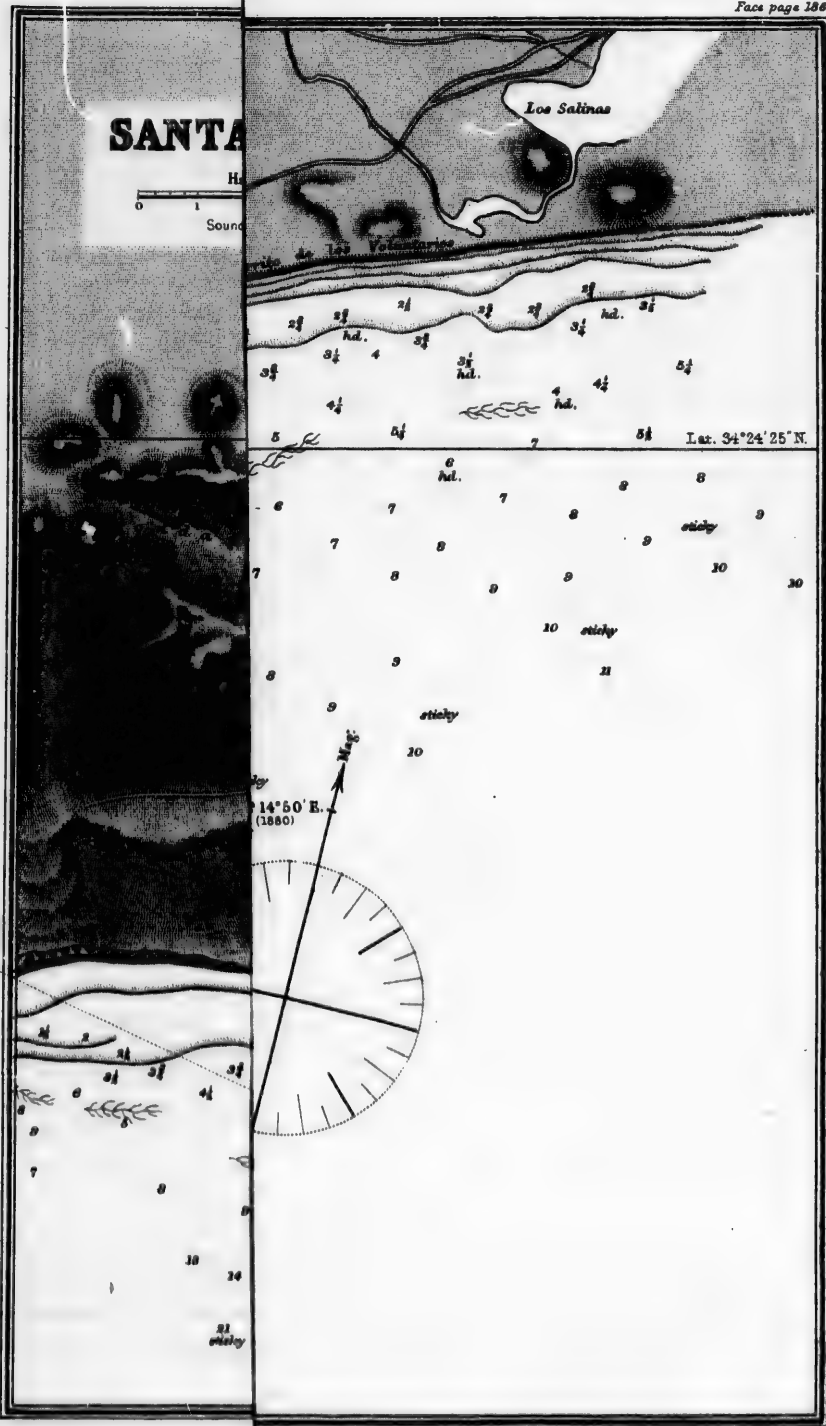
Los Salinas

Rio de los Volcanes

Lat. $34^{\circ}24'25''$ N.

$14^{\circ}50'$ E.
(1880)

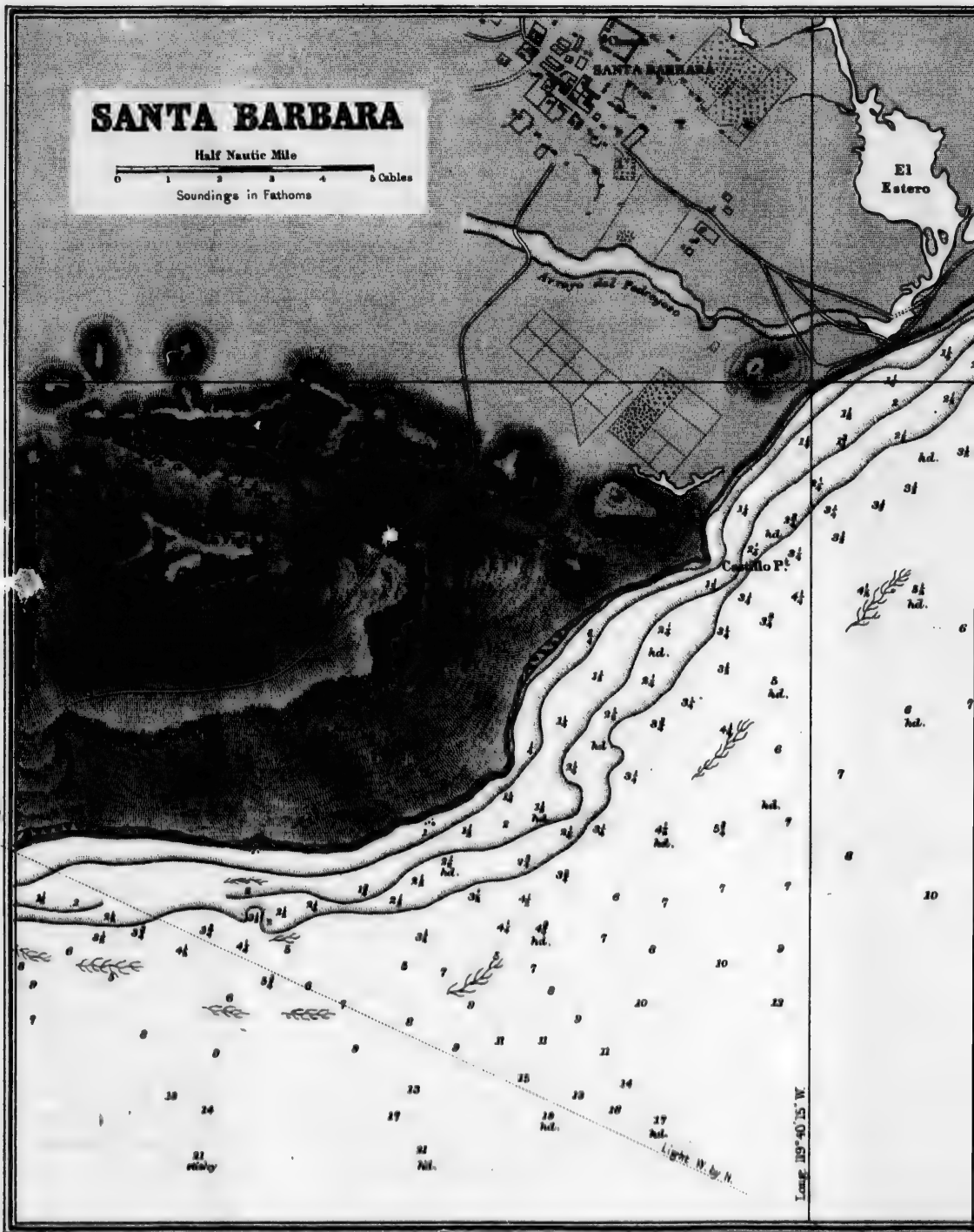
* C.F. (1804)
(76 27 m.)

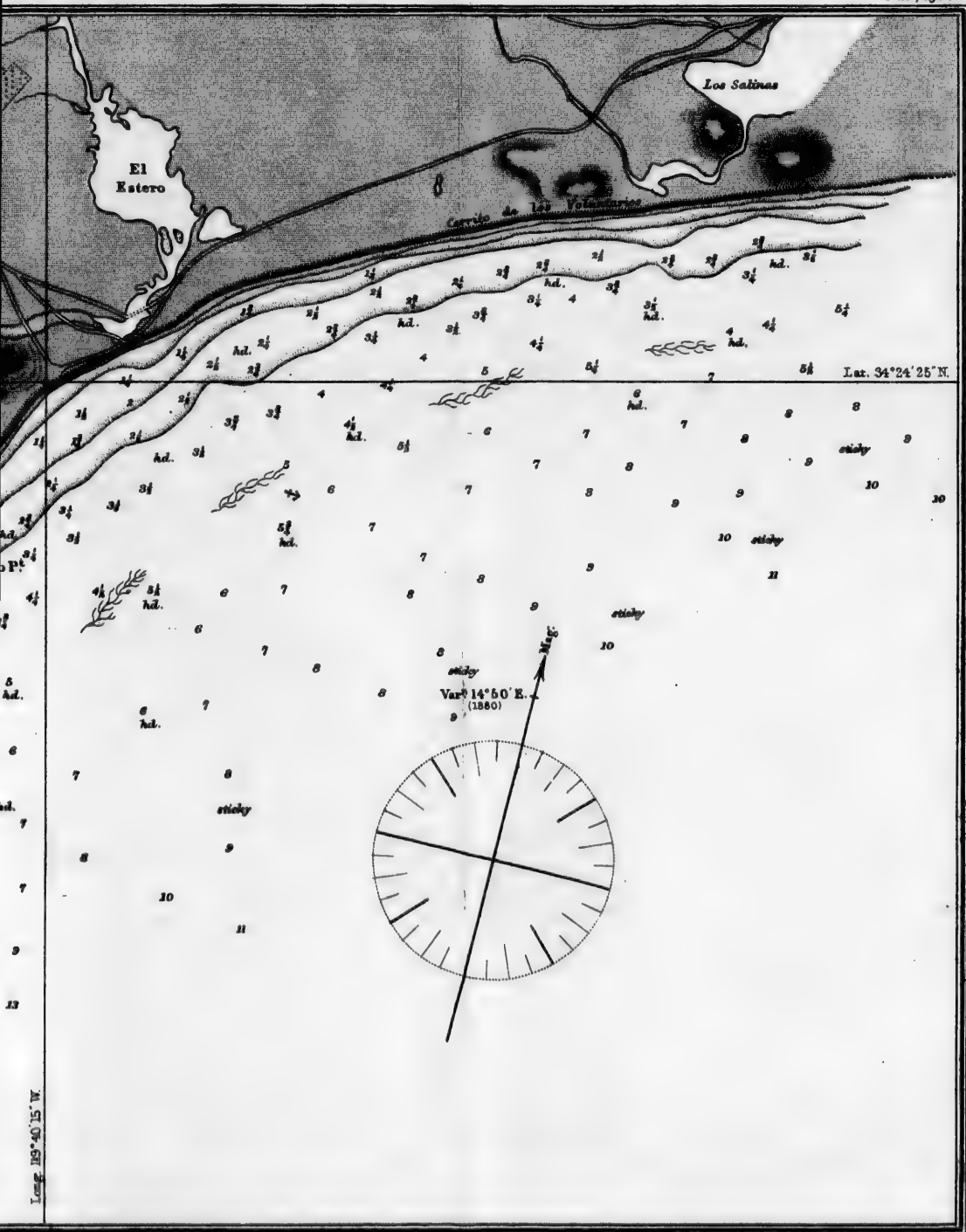


SANTA BARBARA

Half Nautic Mile
 0 1 2 3 4 5 Cables
 Soundings in Fathoms

* C.P. (1867)
 (74 27 m.)





will be a prominent object. Steer for the hill, and upon approaching the anchorage keep outside the line of kelp (here nearly half a mile wide): gradually round the point upon which is situated the lighthouse, and keep along the kelp until abreast of the town, off which anchor in 7 fathoms. Or, pass through the kelp and anchor inside of it in 8½ fathoms, hard bottom. Outside the kelp in 9 or 10 fathoms, the bottom is sticky; vessels occasionally anchor here.

The approach to Santa Barbara from *eastward* or *south-eastward* requires no special remarks. Vessels may pass either eastward or westward of Anacapa island.

Captain John Hall's experience of Santa Barbara agrees with the foregoing—"this bay is only sheltered from the N.W. winds, being exposed to the South and S.W. The anchorage is not very good, being hard sand, and overgrown with sea-weed. We had such a quantity of this on our anchor when we hove it up, that it entirely impeded the ship's progress until we got it clear. We found no tide or currents, but there appeared to be a rise and fall, in-shore, of about 2 feet. All kinds of provisions are cheap here, as also fruits, viz.—grapes, pears, apples, and plums, in the season."

Vancouver has remarked of Santa Barbara, "To sail into the bay requires but few directions, as it is open, and without any kind of interruption whatever; the soundings on approaching it are regular, from 15 to 8 fathoms; the former, from 1½ to 2 miles, the latter within 1½ cables' length of the shore. Weeds were seen growing about the roadstead in many places; but, so far as we examined, which was only in the vicinity of our anchorage, they did not appear to indicate shallower water, or a bottom of a different nature. The shores of the roadstead are for the most part low, and terminate in sandy beaches, to which, however, its western point is rather an exception, being a steep cliff, moderately elevated."

The COAST.—From the lighthouse at Santa Barbara the coast trends W. by S., 87 miles to point Concepcion. At a very short distance behind the coast is a range of rugged hills, over 2000 feet high, forming part of the Sierra Concepcion (sometimes called the Sierra San Inez), whose sides are sparsely covered with timber, and through some of whose gullies and gorges pass small streams abounding in the finest trout; from others issue warm springs having a temperature of about 117° Fahrenheit, and highly impregnated with sulphuretted hydrogen;—these springs are behind the village of Montecito, eastward of Santa Barbara, and by barometric measurement are about 1200 feet above the sea.

At about 8 miles westward of Santa Barbara is a large bitumen pit, which empties directly into the sea, and the bitumen, floating on the water, works *against* the summer or north-west winds even beyond point Concepcion. Very frequently, in calm weather, a great extent of the surface of the channel becomes iridescent from the thin film of bitumen spread over it. The rocks along the shore, even westward of point Concepcion, are covered with it. Sulphur, in large beds and of superior quality, also exists along the seaboard, and manifests itself in all the warm springs.

El Coto.—At about 2 miles eastward of point Concepcion is the anchorage of El Coto, off the entrance to the valley of that name. This anchorage is better than that off Santa Barbara, and the kelp is not so compact. When approaching it from westward, pass point Concepcion at the distance of about three-quarters of a mile, steer E. by N. and gradually round the bluff which is a mile East from the point, giving it

a berth of half a mile; run on a N.N.E. course for three-quarters of a mile, when the valley will open with a sand beach off it. Anchor outside or inside the kelp, according to the choice of depth; 5 fathoms being obtained within a quarter of a mile of the shore, with hard, sandy bottom. At half a mile from shore the depth is 10 fathoms. There is a large rancho at El Coxo, and it is one of the very best tracts for grazing. The beef has a finer flavour and more delicacy than any on the coast. At the head of the valleys and in the mountains is a species of large live oak, very brash when newly cut, but growing hard by seasoning. Willow, for fuel, and water can be obtained here, but neither in abundance. The water is disagreeable to the taste.

POINT CONCEPCION is a remarkable headland, rising to the height of about 220 feet. It is so conspicuous and prominent an object, that it is said, when once seen it will never be forgotten. When made from northward, or from eastward, it rises as an island, but, a nearer approach, discovers it to be a high promontory, stretching boldly into the ocean, and terminating abruptly. The land behind it sinks comparatively low, and at first gradually, but soon rapidly rises to the mountains, which attain an elevation of about 2500 feet. Between 300 and 400 yards south of the face of the cape is a large rock nearly awash, upon which some of the California steamers have struck in very foggy weather.

Vancouver says of this point—"It is remarkable by its differing very much in form from the headlands to the northward. It appears to stretch out from an extensive tract of low land, and to terminate like a wedge, with its large end falling perpendicularly into the sea, which breaks against it with great violence. Off the point the current sets to the north in the early spring months."

Light.—The lighthouse upon point Concepcion is 35 feet high, and shows a light revolving every thirty seconds at 250 feet above the sea, visible 28 miles. The building is white, stands near the pitch of the point, and is considered to be in lat. $34^{\circ} 26' 52''$, long. $120^{\circ} 28' 8''$. A steam fog-whistle, stationed seaward of the lighthouse, is sounded in thick weather for 8 seconds every minute.

From the lighthouse, Richardson rock, off the west end of San Miguel island, bears S. $\frac{1}{4}$ E. distant 22 miles; the east end of San Miguel island S.E. by S. $\frac{1}{4}$ S. 26 miles; and the south-west end of Santa Cruz island S.E. by E. $\frac{1}{4}$ E. 40 miles.

Mr. Davidson of the United States Coast Survey says—"Next to the islands of the Santa Barbara channel, point Concepcion is the most prominent and interesting feature between San Francisco and the peninsula of Lower California. It has very justly and appropriately been termed the 'cape Horn' and the 'Hatteras' of the Pacific, on account of the heavy north-westers that are here met with on coming through the channel, with a great change of climate and meteorological conditions; the transition being remarkably sudden and well defined. An investigation of the temperature of the ocean, north-west and east of the cape, would be highly instructive, as some characteristics would naturally be expected from the abrupt change in the direction of the mountains and coast line. We have frequently seen vessels coming from the eastward with all sail set, and light airs from the north, in a very little time reduced to short canvas upon approaching the cape, and vessels from the north-west coming before a spanking breeze loose it within a few miles after passing the cape into the channel.

These last would be fortunate in reaching Santa Barbara in a day. We have known a vessel to be 8 days working from San Buenaventura to Santa Barbara, whilst a ten-knot breeze was blowing west of point Concepcion.

During some summer seasons the fog is almost interminable, but more particularly among the islands. For the space of six weeks, with clear days and nights at the cape, the islands have been invisible; rising, however, to an elevation of 1000 or 1500 feet, the observer plainly sees the summits of the islands over the sea of fog which envelope them.

When the fogs prevail, they generally roll in from seaward at sunset, and clear away about 10 o'clock next morning."

THE ISLANDS OF CALIFORNIA.

Magnetic Variation in 1879:—At San Clemente, 14° E.; Santa Catalina, San Nicolas, and Santa Barbara 14° 20' E.; Santa Cruz, Santa Rosa, and San Miguel 14° 40' E. The annual increase is estimated to be about 3 minutes.

These islands commencing with the southernmost are named San Clemente, Santa Catalina, Santa Barbara, San Nicolas, Anacapa, Santa Cruz, Santa Rosa, and San Miguel. They are separated from the northern shore by the Santa Barbara channel, which is about 20 miles wide.

When making Santa Barbara channel from north-westward, shipmasters readily estimate their approach in thick foggy weather by the peculiar odour of the bitumen which, issuing from the large pit already mentioned (page 187) as situated on the shore about 8 miles westward of Santa Barbara and floating upon the water, works against the summer winds far beyond point Concepcion. This set westward is found to exist for about 4 miles from shore, and it runs at a maximum velocity of $1\frac{1}{2}$ miles per hour; further out the current is variable, but even there its greatest velocity is attained when running westward. From point Concepcion its direction is southward and westward, being doubtless influenced by a current from the upper coast.

Vancouver directs attention to this bitumen, as follows—"The surface of the sea, which was perfectly smooth and tranquil, was covered with a thick slimy substance, which, when separated or disturbed by any little agitation, became very luminous, whilst the light breeze that came principally from the shore brought with it a strong smell of tar, or of some such resinous substance. The next morning the sea had the appearance of dissolved tar floating upon its surface, which covered the ocean in all directions within the limits of our view, and indicated that in the neighbourhood it was not subject to much agitation."

Sir Edward Belcher, in October, 1880, also observes—"Off this part of the coast, westward of Santa Barbara, we experienced a very extraordinary sensation, as if the

ship was on fire, and after a very close investigation attributed it to a scent from the shore, it being more sensible on deck than below; and the land breeze confirming this, it occurred to me that it might arise from naphtha on the surface."

Among the islands, as far as San Nicholas, the current runs southward. On the Cortez shoal it frequently runs against the N.W. wind at the rate of nearly 2 miles per hour. At other times it has been found to run in an opposite direction with nearly as much strength.

The rainy season here commences in the early part of November, and continues until the middle of March. The quantity of rain that falls does not average over 15 inches, but some seasons are marked by excessive drought. During the winter S.E. gales prevail, and sometimes during the summer months southerly weather will bring up heavy rain.

Cortez Bank.—This bank, within the depth of 50 fathoms, has an extent of about 15 miles in a W. by N. and E. by S. direction, its east end being in lat. $32^{\circ} 24'$; long. $118^{\circ} 59' 30''$, and its west end in lat. $32^{\circ} 32'$, long. $119^{\circ} 17' 30''$. It has an average and nearly uniform width of $8\frac{1}{2}$ miles. The bottom is hard, composed of white sand, broken shells, and fine coral at the south-east portion; and sand, with broken shells, at the north-west. The shoalest and most dangerous part is that known as the Bishop rock, which is 5 miles from the south-east tail of the bank, and has but $2\frac{1}{2}$ fathoms of water upon it. Around this danger the depth increases gradually, and in an extent of $2\frac{1}{2}$ miles in the general direction of the bank reaches but 15 fathoms. The rock is considered to be in lat. $32^{\circ} 25\frac{1}{2}'$, long. $119^{\circ} 5'$; and from it the north-west end of the island of San Nicolas bears N.W. by N., distant 57 miles; and the south-east end of the island of San Clemente N.E. $\frac{1}{4}$ N. 46 miles.

A shoal spot of 10 fathoms is also situated in about the middle of the bank; it is of limited extent, being only half a mile square within the 15 fathom curve. Its position is considered to be lat. $32^{\circ} 26\frac{1}{2}'$, long. $119^{\circ} 10\frac{1}{2}'$, and from it the north-west end of San Nicholas bears N.N.W. $\frac{1}{4}$ W., distant 54 miles; and the south-east end of San Clemente N.E. $\frac{1}{4}$ E., distant 50 miles. From the Bishop rock it bears W. $\frac{1}{4}$ N., distant 5 miles. North-westward of this shoal spot the depth is nearly uniform at 49 fathoms for $7\frac{1}{2}$ miles, and between it and the Bishop rock the depth is uniform at about 48 fathoms.

Upon the Cortez bank the current is variable, frequently setting against the strong N.W. winds with a velocity of nearly 2 miles per hour, and producing at all times a heavy swell, and even in moderate weather breaking heavily upon the rocks. When passing over the bank at night its locality may be known by the increased swell. In the detailed examination of 1856 it was found that the general set of the current was southward and eastward, and the greatest velocity $1\frac{1}{2}$ miles per hour; but no statement was made concerning the prevailing wind.

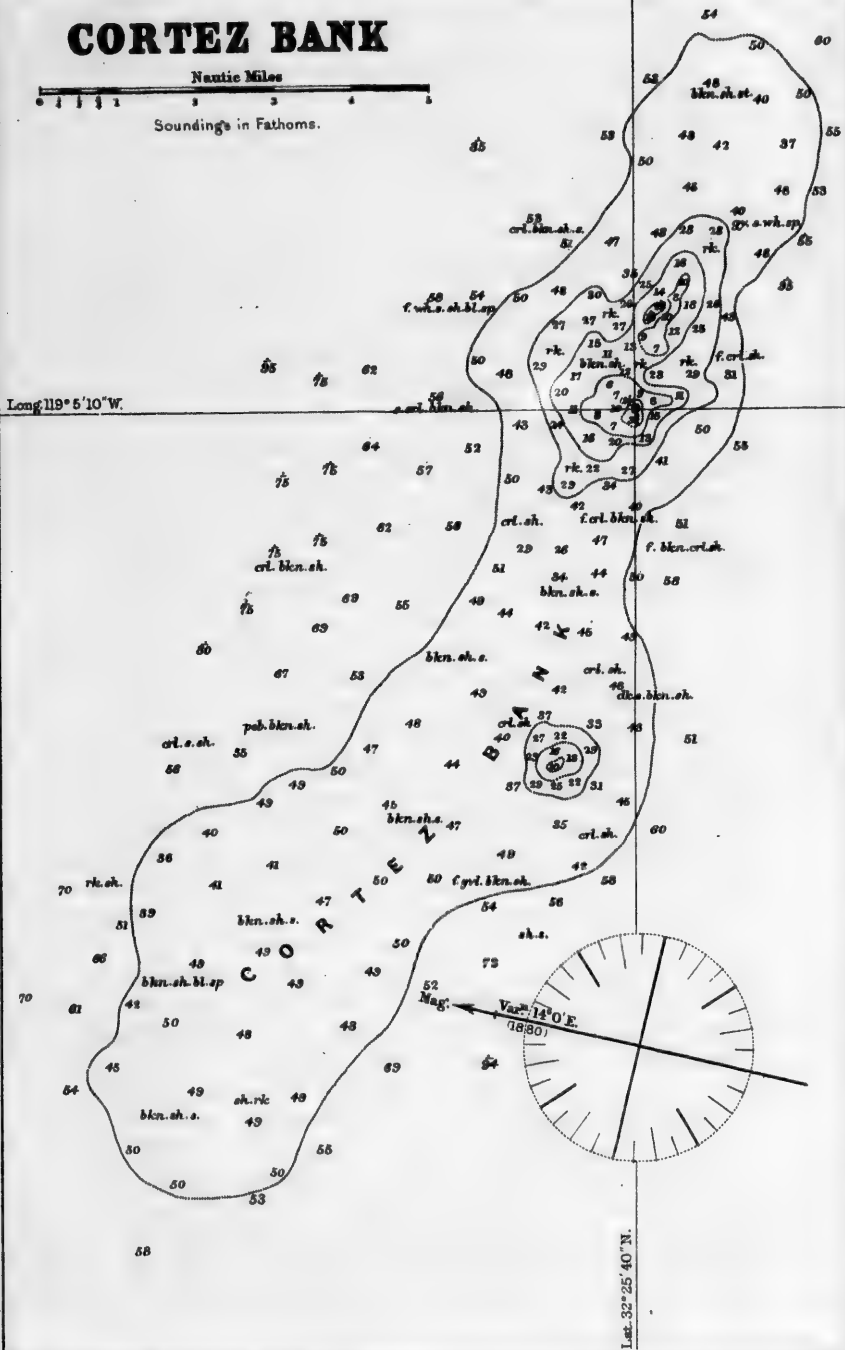
The Cortez bank lies in the direct route now followed by the Panama and San Francisco steamships, and was discovered by Captain Cropper, of the steamship *Cortez*, in March 1853. His position was determined by bearings of San Nicolas and San Clemente, and was very close, being within a mile of the later and best assigned place. He says that the water around it was in violent commotion, and thrown up

CORTEZ BANK

Nautic Miles

Soundings in Fathoms.

Long. 119° 5' 10" W.



LONDON, James Imray & Son.

suddenly in columns at regular intervals of 4 or 5 minutes. At first he thought he saw breakers; and occasionally the water broke as on a reef, but he became confident that the disturbance was owing to submarine volcanic agency. The specimens of the bottom negative this idea. He found his depth of water reduced from 42 fathoms to 9, from which it is evident that he was on the shoal spot in about the middle of the bank, and saw the water breaking upon the Bishop rock,—the same appearance that he witnessed having been seen many times since by others, and the nature of the rocky bottom and depth of water supporting the assumption. The position of the bank was afterwards more closely determined by the commander of the steamship *Pacific*; but in the Coast Survey operations the 10-fathom spot was found, and the surveying schooner used in that duty was anchored on it 5 days.

Attention was subsequently called to a more extended examination of the vicinity by the clipper ship *S.S. Bishop*, of Philadelphia, striking (1855) upon the rock since called by her name, and, under unfavourable circumstances, two points of rock were supposed to exist, to which approximate positions were assigned. In 1856 the bank was sounded over to the extent of 180 square miles; and from a consideration of the highly favourable circumstances under which this last survey was made, confidence is expressed that the point of rock above mentioned is the only one existing; but as it is very difficult to find detached single points of rock below the surface in a sea-way, it will not be surprising if others be eventually found. At all events a prudent navigator will give this bank a good berth. Its existence forcibly suggests the probability that other submarine ridges lie parallel to the coast.

SAN CLEMENTE is a lofty bold island, the south end of which is in lat. $32^{\circ} 49' 30''$, long. $118^{\circ} 24' 15''$. From this point it extends 16 miles in a N.W. by W. direction, with an average breadth but little exceeding 3 miles, and at the same time gradually decreases in height; its greatest elevation is estimated to be 1500 feet. From its south extremity point Loma, San Diego, bears E. $\frac{1}{4}$ N. distant nearly 60 miles. The island is very barren and neither wood nor water can be procured from it. The soundings around it show a depth of 80 to 180 fathoms close in shore, except off the north-west point, from which a reef makes out about a mile. In 1862 there were no inhabitants and the only animals upon the island at that time were wild sheep.

At the northern end of the island a small indentation of the shore line in lat. $33^{\circ} 2'$, long. $118^{\circ} 32' 30''$, forms an anchorage having a width of three-quarters of a mile, by half a mile in depth, with soundings decreasing from 12 fathoms (on the line of a large rocky islet at the west side to a point E. by S. from it) to 4 and 5 fathoms close in shore. Kelp will be found in 10 fathoms, but the bottom is tolerably regular and hard. It is anything but a pleasant or safe anchorage in bad N.W. weather, and even in heavy southerly weather the swell must roll in disagreeably.

There is also anchorage under the S.E. end of the island, in the deepest part of the indentation of the shore, but the bottom is rocky and irregular. The S.E. point is a vast sandstone pyramid; and when it is brought to bear North, and the shore three-quarters of a mile distant, the anchorage will lie W. by N. $\frac{1}{4}$ N. $1\frac{1}{4}$ miles, inside the kelp, in 10 to 15 fathoms, and a third of a mile from the narrow sand beach at the foot of the cliffs. Outside of the kelp the depth ranges from 10 to 80 fathoms. This anchorage affords protection in heavy north-west weather.

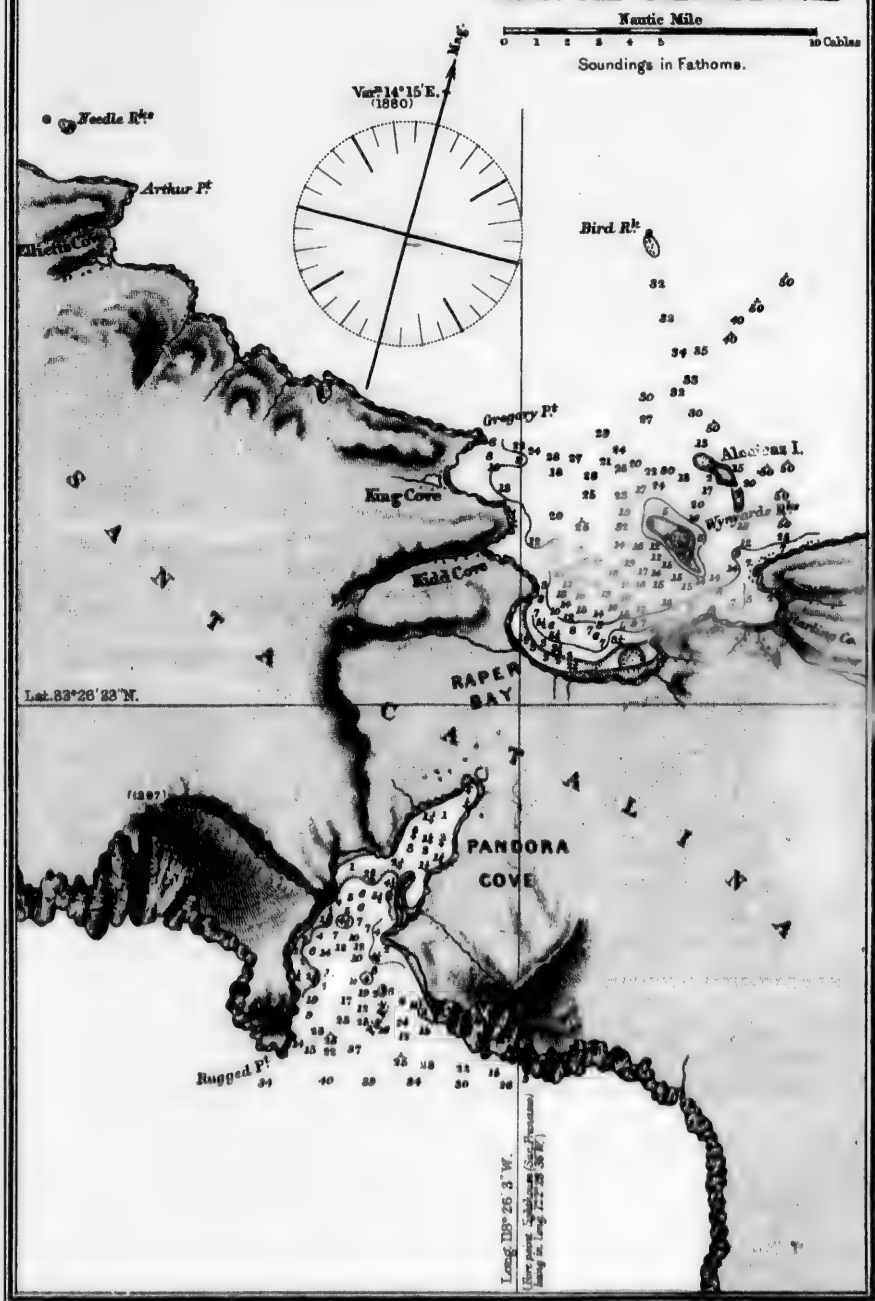
SANTA CATALINA.—The south-east end of this island is in lat. $33^{\circ} 20'$, long. $118^{\circ} 16'$, and bears N. $\frac{1}{4}$ W. from the south-east point of San Clemente; thence the island extends W. by N. $\frac{1}{4}$ N., $17\frac{1}{2}$ miles, with an average breadth of 5 miles in its southern, and of 2 miles in its northern part. It is very lofty as it rises to the height of about 8000 feet, and is remarkable for a great depression, at 5 miles from its north end, which runs partly through it and forms a cove on each side, in either of which (according to the direction of the prevailing wind) vessels may anchor and obtain shelter. This depression in the island bears S.S.W. from point Fermin, San Pedro bay, distant $18\frac{1}{2}$ miles. The land between the two coves is not more than 80 feet high; but the hills on each side rise to the height of 2000 or 8000 feet, so that when Santa Catalina is viewed from a good offing, north or south of it, it appears to be two islands.

Pandora Cove.—The cove on the south side of the island, just alluded to, is only about a third of a mile in width, but its approaches are bold, and, so far as known, free from hidden dangers. To find it, run along the south-west side of the island and make for the depression; then stand in for the opening, keeping a little left of mid-channel until a third of a mile inside of the heads; thence keep in mid-channel until abreast of the long, low point on the right, and anchor in 5 fathoms, soft bottom. There is a depth of 8 fathoms immediately inside of the low point, with hard bottom, but not room enough for a vessel to swing. If the wind is blowing from the N.W., vessels will lose it at the heads, and perhaps require to be towed in.

Raper Bay.—The cove at the depression on the north side of the island is also small, with a reef in the centre and two large outlying rocks. A steamer could run in on the west side of the rocks, and anchor off the low beach in 10 fathoms, when the reef would lie N. by E. from her, distant one-eighth of a mile. Small craft will here find protection from the prevailing winds, but experience difficulty in getting out, as there is always a swell setting in, and the wind blows in flaws and eddies on account of the high hills. Between the two points forming the anchorage the distance is half a mile, and the depth a third of a mile. According to the plan on the Admiralty chart No. 2797, edition 1875, the low shore of this cove is in lat. $33^{\circ} 26' 23''$, long. $118^{\circ} 25' 7''$.

The soundings around the island show deep water, from 19 to 70 fathoms, close in shore, with no outlying rocks except off and near the north cove. The shores are rocky, and on the southern side fearfully abrupt, but on the northern shore there are several indentations, where boats may land at almost any season. Deep and precipitous gulches are formed by the ridges of rock running diagonally across the island from N.E. to S.W., and occasionally a small valley varies the scene. A few settlers cultivate these spots, but their inconsiderable extent precludes the realizing of anything beyond a bare sustenance. At about midway between the north-west extremity of the island and the great break there is a spring of good water, and at the south-east point good water has been obtained by sinking wells to a depth of 50 feet or more, but in the intermediate places water found at the same depth is brackish. There is a large pond on the low land between the anchorages, but the water is very brackish. Scrub-oak is obtained for fire-wood, and a growth of thorny bushes covers the whole island, rendering

ANCHORAGES IN SANTA CATALINA



LONDON, James Innes & Son.

travelling very difficult. The island is partially stocked with cattle and sheep, and at one time vast numbers of wild goats abounded, but they have helped to supply the California market with fresh meat.

SANTA BARBARA.—This little island is distant about 23 miles in a W. by S. direction, from the north end of Santa Catalina, and its centre is in lat. $33^{\circ} 30'$, long. $119^{\circ} 2'$. It is situated almost mid-way between the northern end of San Clemente and the east end of Santa Cruz, and at an equal distance from the shores of Santa Catalina and San Nicolas. Its extent does not exceed 2 miles of shore-line; its elevation at the highest part is about 500 feet, and the top has an area of about 80 acres covered with soil. There is no water, and not a vestige of wood.

The shores of the island are rocky and abrupt, presenting on the north-east and south sides perpendicular cliffs exposed to the full force of the sea. Landing is at all times difficult and dangerous. The water around it is deep, and there are no out-lying rocks. It is said to be much more enveloped in fogs than the neighbouring islands.

SAN NICOLAS is distant 25 miles S.W. from Santa Barbara, and is farther from the land than any of the islands; it is also the driest and most sterile. It is 8 miles long W.N.W. and E.S.E., and has an average breadth of $3\frac{1}{2}$ miles. Its height is about 600 feet, and, like San Clemente, it is comparatively flat-topped, but falling to the southern end. The sides are bold and precipitous, and composed of coarse sandstone. The depth at a moderate distance from it is 10 to 48 fathoms; at $2\frac{1}{2}$ miles northward from it are soundings of 40 and 60 fathoms. From its north end point Fermin, San Pedro, bears N.E. by E., distant 65 miles.

The south-east end of San Nicolas island is a low sandy point, the approximate position of which is lat. $33^{\circ} 18'$, long. $119^{\circ} 25'$. Vessels may anchor off this end of the island in 10 fathoms, hard bottom, but some inconvenience is occasioned by the steady southerly current; this makes a landing difficult, as the surf cuts the beach at an acute angle.

Breakers extend from the north end of the island about $2\frac{1}{2}$ miles, and it is said that they also extend from the southern point to the distance of $1\frac{1}{2}$ miles; this is doubtless in heavy weather.

Begg Rock.—At about 7 miles W.N.W. from the north-west end of San Nicolas is the Begg rock, which is about 40 feet high, bold, and so well defined as to be distinctly visible from the distance of 10 miles. Its position is about lat. $33^{\circ} 22'$, long. $119^{\circ} 30'$.

The depth near the south-east side of the Begg rock is 62 fathoms, and near its north-west side 52 fathoms. Between it and San Nicolas, the bottom is irregular and rocky, and at nearly midway are soundings of 40 to 45 fathoms, coral.

ANACAPA, although always spoken of as one island, is a curiously formed group of three islands, extending in nearly an E.N.E. direction 5 miles. The geographical position of its west end is lat. $34^{\circ} 0' 55''$, long. $119^{\circ} 21' 15''$. From its west end the east point of the island of Santa Cruz bears W. $\frac{1}{2}$ S. distant 4 miles; and, from its east end Santa Barbara light bears N.W. $\frac{1}{4}$ W., 28 miles, and point Hueneme, the nearest point of the main land N.E. by N. $\frac{1}{4}$ N., $10\frac{1}{2}$ miles.

The western island of Anacapa consists of a peak 980 feet in height, with a base of

over 2 miles by three-quarters of a mile; this is separated from the middle island by a gap 10 feet wide, through which boats can pass. The middle island is nearly 2 miles long by 500 yards wide, whilst the eastern island is little over a mile long by 500 yards wide. The gap separating the middle and eastern islands is over 200 yards wide, but so completely filled with rocks as to be impassable for boats, which can, however, land on the north side of the island.

The whole group forming the island of Anacapa is composed of coarse dark grey sandstone, very rotten and crumbling. The sides are perpendicular, and from 250 to 800 feet high. The main peak is marked on the north side by several deep gulches with almost vertical sides, running from the summit to the bluff. The whole formation is filled with innumerable cavities, giving it the appearance of an enormous blackened honeycomb. At the eastern extremity is found a very beautiful arch in one of the outlying rocks. The soil is loose and thin, and not a drop of water is to be found on the islands.

The depth immediately off the cliffs of Anacapa is generally from 5 to 6 fathoms, which increases to 17 and 25 fathoms at an offing of about a quarter of a mile. Close to the arched rocks are soundings of 9 to 11 fathoms. The island is almost entirely encircled by kelp, which extends in some places about half a mile off shore. The general depth in the channel between the island and Santa Cruz, is 80 fathoms, grey sand, coral and shells; in some places, however, as much as 85 fathoms occurs.

SANTA CRUZ.—This island, the largest of the California islands, lies about 20 miles from the coast and opposite to, or almost due South from, the town of Santa Barbara. It is nearly 25 miles long, east and west, and has an average width of 4 miles; its western part is the broadest. From its east end (San Pedro point), Santa Barbara light bears N.W. $\frac{1}{2}$ N., 24 miles; from Prisoner harbour, this light bears N. by W. $\frac{1}{2}$ W., 22 miles; and from its north-west end (Negro point) the same light bears N. by E. $\frac{1}{2}$ E., 21 miles.

The island, composed of coarse dark grey sandstone, crumbling and rotten like that of Anacapa, is bold and nearly 2000 feet in height. Its eastern part is extremely irregular, barren, and destitute of water; and the surface of the north-eastern portion is thickly strewn with large angular pieces of stone, broken as if with a hammer. Its greatest elevation is 2410 feet above the sea. On the lower parts of the surface grass is abundant and for some years has sustained a stock of sheep so considerable that 15,000 to 20,000 head have been taken from the island annually.

On the northern side of the island, and near the middle, the shore makes a moderately deep curve, forming a roadstead named Prisoner harbour, at the opening of a valley, where plenty of wood and water can be obtained. Anchorage may be had at a quarter of a mile from the middle of the beach in 15 fathoms, sandy bottom; but there is no protection from the heavy swell setting in with a north-wester,—it, however, affords excellent refuge from gales from south-eastward. The approximate position of this harbour is lat. $34^{\circ} 0' 30''$, long. $119^{\circ} 36' 30''$.

Anacapa Bay.—At the eastern extremity of Santa Cruz island, immediately to the southward of San Pedro point, is an open bay, known as Anacapa bay (See plan on Admiralty chart No. 2797). Vessels anchor in 13 or 14 fathoms, about a third of a mile from

the boat-landing in the northern part of the bay; here are moored two buoys. The greater part of the shore hereabout is lined with kelp, and rocks extend off several of the projecting points of the bay. The geographical position of Observatory point is lat. $84^{\circ} 1' 19''$, long. $119^{\circ} 26' 57''$.

The soundings round the island show deep water close to the shore. There are rocks showing quite plainly at one mile from the south-west part of the island, and others lying off Fraser point, its westernmost extremity.

There is a well-marked submarine plateau extending from the north face of Santa Cruz island, and a remarkable canon off the south-west corner of the island. The canon has been traced to its head, in Santa Cruz channel, where 100 fathoms have been formed with 40 fathoms on each side. In reference to this remarkable depression in the sea-bottom Lieut. Com. Taylor, U.S. Coast Survey, 1874, says:—"Commencing at about the middle of the southern part of Santa Cruz channel, the canon turns at once to the eastward and sweeps along parallel to the south shore of Santa Cruz island for some miles, when it again turns southward and goes to the deep sea at a point a little east of Gull island (?). It averages 800 fathoms in depth for the greater part of its length, with 40 and 50 fathoms on its seaward side. The bottom is rock and shells as far as the turn to seaward, where the ooze of the deep sea begins to show."

The U.S. Coast Surveyors, 1874, discovered several good anchorages and boat-landings at Santa Cruz, additional to those heretofore resorted to, and the positions of some good fresh-water springs were ascertained.

SANTA ROSA.—This is the middle island of the group off the coast between Santa Barbara and point Concepcion. Its general shape is that of a parallelogram, with the direction of the longer axis almost east and west, and 18 miles in length; and the shorter north and south, giving it a width of 9 miles. Parts of it are elevated more than 1200 feet.

About a mile northward of the north-west point of the island is a coral reef with only 10 feet water over it.

There is a good passage (Santa Cruz channel) between Santa Cruz and Santa Rosa, having a width of 5 miles, and one also between it and San Miguel of $2\frac{1}{2}$ miles. Both passages are frequently used by the California and Panama steam ships.

The soundings round the island do not show such deep water as that existing round the others. On the north-west and north-east sides a depth of 15 to 20 fathoms is found at 2 miles from the shore; on the south-east and south-west sides the water is much deeper.

The outline of the island is bold, but not so high as Santa Cruz; its shores are steep and broken. The hills are undulating and covered with coarse grass and bushes.

Becher Bay.—On the north-east side of Santa Rosa island, between Carrington (off which is a reef) and Skunk points, is a bay in which vessels can find anchorage protected from westerly and southerly winds; it is named Becher bay (See plan on Admiralty chart, No. 2797). The anchorage is in 7 or 8 fathoms, half a mile off shore, nearly abreast a fresh-water stream. The shore of the bay is lined with kelp which extends as far out as the depth of 6 fathoms. Inside this line of kelp the water

becomes shoal and irregular in depth. The geographical position of Observatory point, about half a mile northward of the fresh-water stream, is lat. $34^{\circ} 1' 10''$, long. $119^{\circ} 58' 2''$.

SAN MIGUEL.—San Miguel, the westernmost of the California islands, is 6 miles long in an E. by N. and W. by S. direction, and has an average breadth of 2 miles. From its west end point Concepcion bears N. by W. $\frac{1}{2}$ W. distant 25 miles, and point Arguello N.W. by N. $\frac{1}{2}$ N. 85 miles. This end of the island is bold and narrow, gradually increasing in breadth until it attains $3\frac{1}{2}$ miles; as seen from south-westward, it appears to be several hundred feet in height, and composed of sand dunes, therein differing from all the other islands. Off the western end of the island, near the Castle rock, breakers extend about $1\frac{1}{2}$ miles seaward.

Cuyler Harbour.—On the north-east side of the island is a small bay named Cuyler harbour, off which lies a rock or islet more than a quarter of a mile long, and several hundred feet high. From this islet to the head of the bay the distance is $1\frac{1}{2}$ miles, and the course E.W. Close under the western side of the bay is anchorage in 6 fathoms, secure from every wind except the North, which rarely blows. The eastern part of the bay is full of rocks and reefs, and ought to be avoided. The reef in the middle of the bay bears S.W. from the west end of the islet, distant half a mile; it is the same distance from the west point of the bay, near the anchorage, and bears from it E. by S. At about a third of a mile S.W. by S. $\frac{1}{2}$ S. from the west end of the islet is a rock, and rocky bottom; and on the same line of bearing, but half a mile distant, another. The southern part of the islet is about half a mile from the east shore of the bay. The bay shores are high, steep, and undulating, and covered with coarse grass and bushes. There is no water here in summer, but during the winter water drains down the gully at the beach in the middle and southern part of the harbour. The approximate geographical position of the south-west part of this harbour is lat. $34^{\circ} 2' 50''$, long. $120^{\circ} 11' 30''$.

The sea round San Miguel island is deep, a depth of 22 fathoms prevailing at about a mile from its shores. In mid-channel, between it and point Concepcion, there is no bottom at 120 fathoms.

Tides.—The corrected establishment of the port at Cuyler harbour is 9h. 25m. The mean rise and fall of tides is 3.7 feet; of spring tides 5.1 feet; and of neap tides 2.8 feet.

Richardson Rock, &c.—This rock, showing well above water, lies N.W. by W. distant $4\frac{1}{2}$ miles from the western extremity of San Miguel; it bears S. $\frac{1}{2}$ E. distant 22 miles from point Concepcion, and S.S.E. 80 miles from point Arguello. Off it a reef extends a short distance in all directions. Deep water is found around the rocks, and vessels may pass between them. Another rock lies N.W. by W. $2\frac{1}{2}$ miles from Harris point, the northern extremity of San Miguel; it is known as Wilson rock.

POINT CONCEPCION TO POINT REYES.

Magnetic Variation in 1879;—At San Luis Obispo 15° 15' E.; San Simeon 15° 30' E.; Monterey Bay 16° E.; San Francisco Harbour 16° 30' E.

It is estimated to increase annually about 3 minutes.

THE COAST.—From point Concepcion the coast trends N.W. by W. $\frac{1}{2}$ W. 12 miles to point Arguello. The shore is bold, curving slightly eastward between the two points, and the mountains immediately behind are not less than 3000 feet in height. At 200 or 300 yards off point Arguello are some detached rocks, upon which the steamship *Yankee Blade* struck and was lost on the 1st of October, 1854, and 415 persons perished.

At 8 miles northward of point Arguello is a small stream named La Purissima, from the mission La Purissima Concepcion situated a few miles inland; it rises in long. $119^{\circ} 20'$, at about 15 miles from the coast, and runs parallel therewith behind the Sierra Concepcion.

The first point northward of point Arguello is point Purissima, from which a reef extends about a quarter of a mile to the S.S.W.* Between points Purissima and Sal, in lat. $84^{\circ} 54'$, long. $120^{\circ} 40'$, a distance of $7\frac{1}{2}$ miles, is a small stream named Guyamas.

Point Sal anchorage is in the bay close to the southward of point Sal; here vessels anchor in 9 fathoms water, about a mile off the shore. The bay is skirted by breakers.

From point Arguello to point Sal the distance is 19 miles in a N. by W. $\frac{1}{2}$ W. direction. Point Sal is marked by streaks of yellow sand, except at the extreme point; the extremity is formed by high, round, black rocks, off which are several sunken rocks, extending half a mile southward and westward. This stretch of the coast is very similar to that behind points Concepcion and Arguello, but, after passing point Sal, the mountains fall back, and the shore is formed of sand hills. The general trend thence is North, until the shore commences sweeping westward to form the bay of San Luis Obispo, and the shores become high and steep.

SAN LUIS OBISPO.—At about 17 miles northward of point Sal, and at nearly 36 miles from point Arguello, is the bay of San Luis Obispo, which is an open roadstead, exposed to southward and by no means a desirable anchorage, for even during heavy north-west weather a bad swell rolls in, rendering it extremely uncomfortable. The landing is frequently very bad, and often impracticable, but the best place is in the mouth of the creek, keeping the rocks at its mouth on the starboard hand. Fresh-

* This point is known on the coast as point Federnales, signifying point of Flints, but now generally and erroneously printed Pedro Nales. Formerly it was called San Pedro Nolasco. Near this point the steamship *Edith* was lost in 1849. The state survey of California places point Federnales only 3 miles northward of point Arguello.

water may be obtained from a small stream opening on the beach at half a mile westward of the creek.

The distance from the rock off point San Luis to the mouth of the creek is $1\frac{1}{2}$ miles; from the same rock to a *white* rock the bearing and distance are E. by N. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles;—a *black* rock lies half-way between the white rock and the mouth of the creek.*

The estimated position of the bluff at the east side of the small fresh-water stream westward of the creek in San Luis Obispo bay, is lat $35^{\circ} 10' 37''$, long. $120^{\circ} 48' 81''$.

Tides.—The corrected establishment of the port of San Luis Obispo is 10h. 8m. The mean rise and fall of tides is 3.6 feet; of spring tides, 4.8 feet; and of neap-tides 2.4 feet.

At about 10 miles inland from the bay of San Luis Obispo is the town of the same name, situated in the middle of an extensive and excellent grazing country. Communication is maintained between the bay and San Francisco and other ports by steamers, and lines of packets.†

Esteros Bay.—From point San Luis the coast trends W.N.W., for a distance of 8 miles to point Buchon; close along this shore are several large rocks. Thence the coast bends abruptly northward, running to the high conical rock known as El Moro, distant 8 miles—these two shores forming the seaward base of mount Buchon, which rises to a great height and is readily distinguished in coming from the northward or southward.

From El Moro the shore gradually trends westward, and forms a deep indentation known as Esteros bay. Behind El Moro are several lagoons or streams, and the high land retreats for some distance, leaving the shore low and sandy, while the north shore is rugged, and guarded by rocks. The north-west point of the bay, named point Esteros, bears N.W. $\frac{1}{2}$ N. from point Buchon, distant 18 miles; within these points the shore line of the bay recedes about 5 miles.

From point Esteros to the western point of the anchorage of San Simeon the coast runs nearly straight N.W. by W., for a distance of 15 miles. The shores are not so bold as those southward or northward of it, and the mountains fall well back, leaving a fine undulating country of no great elevation, and well suited to agriculture.

* During the prosecution of U.S. Coast Survey in 1874 three sunken rocks, dangerous to navigation, were discovered in San Luis Obispo bay. One of these, in 14 feet water, is stated to lie a mile southward of Rocky bluff; the others, in 18 feet water, are about half a mile apart and lie about $1\frac{1}{2}$ miles south-west of Whaler island at the extremity of point San Luis.

† It is stated that there is a sunken rock at about 8 miles S.S.W. from point San Luis, upon which kelp has been found at the depth of 4 fathoms. On the old Spanish charts of this coast, an island appears laid down in that direction, but distant about 8 leagues. One of the Pacific mail steam ships laid-to in a south-east gale and thick fog off point Concepcion, and drifting northward came unexpectedly upon a sunken rock, upon which the sea was breaking heavily. The commander supposed the vessel to be then off point Sal, and had so plotted the rock upon his chart; but upon being informed of the alleged existence of a rock off San Luis Obispo, he was satisfied that he had been near it, but unfortunately had no opportunity of determining his position.

This locality demands a thorough examination, as it is in the direct track of the whole California trade from San Francisco.

SAN SIMEON BAY.—This is a small exposed roadstead, situated in lat. $35^{\circ} 38' 24''$, long. $121^{\circ} 10' 22''$ *, in which tolerably good anchorage may be obtained during north-west winds, but it is unsafe with southerly winds. The south-west point of the bay bears N.W. by W. from point Esteros, and is distant 15 miles. The shore of the bay trends northerly for about half a mile, and then sweeps away westward about $1\frac{1}{4}$ miles, gradually taking a south-east direction. The land behind the bay is comparatively low and gently undulating, the high hills retiring well inland.

Vessels from *northward* may run boldly round the S.W. point of the bay, within a few hundred yards of the shore, in 8 or 9 fathoms; they should then bear up northward and anchor anywhere off the sand beach, in 5 fathoms, hard bottom, at a little more than a quarter of a mile from shore. The beach is half a mile long, stretching well out, and rendering the landing disagreeable with any swell; but in such cases it is usual to land on the western part of the beach. Eastward of the sand-beach the shore is bluff and skirted with rocks. Vessels from *southward* must make short tacks close in shore, or they will assuredly miss the bay. The only sure marks for it are the Piedras Blancas, subsequently mentioned, and the lighthouse in their vicinity.

Piedras Blancas and Light.—From San Simeon bay the coast trends W. $\frac{1}{4}$ N., 4 miles to the Piedras Blancas, two large white sharp-topped rocks, situated a short distance from the shore, the outer and larger of which is in lat. $35^{\circ} 39'$, long. $121^{\circ} 15'$. They are very conspicuous rocks, and as there are none like them on this part of the coast, they are an excellent mark for the bay of San Simeon. From them, point San Luis bears S.E. $\frac{1}{4}$ E., distant 38 miles; point Esteros S.E. by E. $\frac{1}{4}$ E., 18 miles; and point Arguello S.E. $\frac{1}{4}$ S., 72 miles.

A lighthouse is erected on the point immediately behind the Piedras Blancas rocks. It exhibits a *fixed white light*, *flashing* every 15 seconds, at 170 feet above the sea, visible 19 miles. The structure is a conical brick tower, painted white; the lantern and dome are red. Its approximate geographical position is lat. $35^{\circ} 40'$, long. $121^{\circ} 16'$ †.

THE COAST.—From the Piedras Blancas the coast trends N.W. $\frac{1}{4}$ W., a distance of 57 miles, in an almost perfectly straight line. At about 18 miles from these rocks the above mentioned bearing cuts a bold bluff and rounded point named Punta Gorda, off which, and for 2 or 3 miles along the shore northward, there are many rocks.† Continuing on the same bearing, and at a distance of 49 miles from Piedras Blancas, is point Sur, which extends out nearly half a mile. As seen from northward or south-

* The place of observation was on the rise just off the beach, and bearing N. 5° W., from the south-west point of the bay.

† The rock on which the *Harlech Castle* was wrecked lies about $1\frac{1}{4}$ miles north of Piedras Blancas, about two cables inside the kelp line and inside the line adjoining the adjacent points north and south of it. The depth is 10 fathoms one mile outside the rock and 3 or 4 fathoms inside; and it is said to have 14 feet water upon it. (U.S. Coast Survey, 1870).

‡ This point is the cape San Martin of Cabrillo. As there is a point under cape Mendocino, more generally known as Punta Gorda, it has been suggested that this point retain the name given to it by Cabrillo.

ward, at a distance of 10 miles, point Sur appears as a high, large, round-topped island; but upon approaching it a low neck of land is seen, connecting it with the main. Its approximate position is lat. $36^{\circ} 19'$, long. $121^{\circ} 52'$.*

The highest peak of the range bordering the coast lies 6 miles in from point Sur, and attains an elevation of 4414 feet.

Still continuing on the same bearing, 57 miles from Piedras Blancas and $7\frac{1}{2}$ miles from point Sur, another slightly projecting point is passed, at about one mile eastward of the course. Thence the coast trends more eastward, running N.N.W. for 8 miles, to point Cypress, and passing point Carmel, the south point of Carmel bay.

From point Arguello to point Sur the bearing is N. 44° W., and the distance 120 miles. From point Sur to point Reyes the bearing is N. 48° W., and distance 118 miles.

The mountains, which had fallen back behind Los Esteros, gradually approach the shore-line north of San Simeon, and about 10 miles north of Piedras Blancas they come down abruptly to the coast, and run parallel with it to point Carmel, forming one of the boldest shores on the California coast, and attaining a uniform elevation of nearly 4000 feet. These mountains are known as the Sierra de Santa Lucia. From their precipitous faces may be seen cascades falling from a height of 40 or 50 feet directly into the sea.

Carmel Bay.—Between point Carmel and Cypress, which are about 8 miles apart, lies the small, rocky and unsafe bay of Carmel. At the southern extremity is a small cove, sufficiently land-locked and protected for small vessels. In the vicinity there is an extensive quarry of granite, and several small coasting vessels are employed for its transportation to San Francisco; but there is so little space that they are compelled to warp in and out by buoys placed at the entrance. Point Cypress, the north point of the bay, is low, and covered with cypress to the water, and is the first wooded point met with in coming from southward. The upper branches of the trees are spread out by the influence of the strong prevailing winds, and present a flat or umbrella-like appearance. The Mission del Carmelo is situated but a short distance from the shores of the bay, and can be seen from the water in certain directions.

The coast.—From point Cypress to point Pinos the general direction of the shore is N. $\frac{3}{4}$ E., and the distance 4 miles. Point Pinos makes out as a low rounding point, bringing the pines, with which it is covered, within a quarter of a mile of the shore, off which the rocks make out a quarter of a mile, and the line of 8 fathoms nearly half a mile, when the depth suddenly increases to 10 or 15 fathoms, and at a mile reaches 40 or 45 fathoms. The 8-fathom line follows the shore within a third or half a mile into Monterey, whilst outside of that line the depth increases as suddenly as off the point. Vessels should always give point Pinos a good berth, as a very heavy swell almost invariably sets upon it. This point is the northern termination of the long and elevated range named Sierra de Santa Lucia, extending southward and forming the bold rocky coast-line to San Luis Obispo.

* The steam ship *Ventura*, in April 1874, ran upon some rocks about a mile north of point Sur. Outlying rocks and kelp were observed to the south-east of this rock at a considerable distance off shore. (U.S. Coast Survey, 1875).

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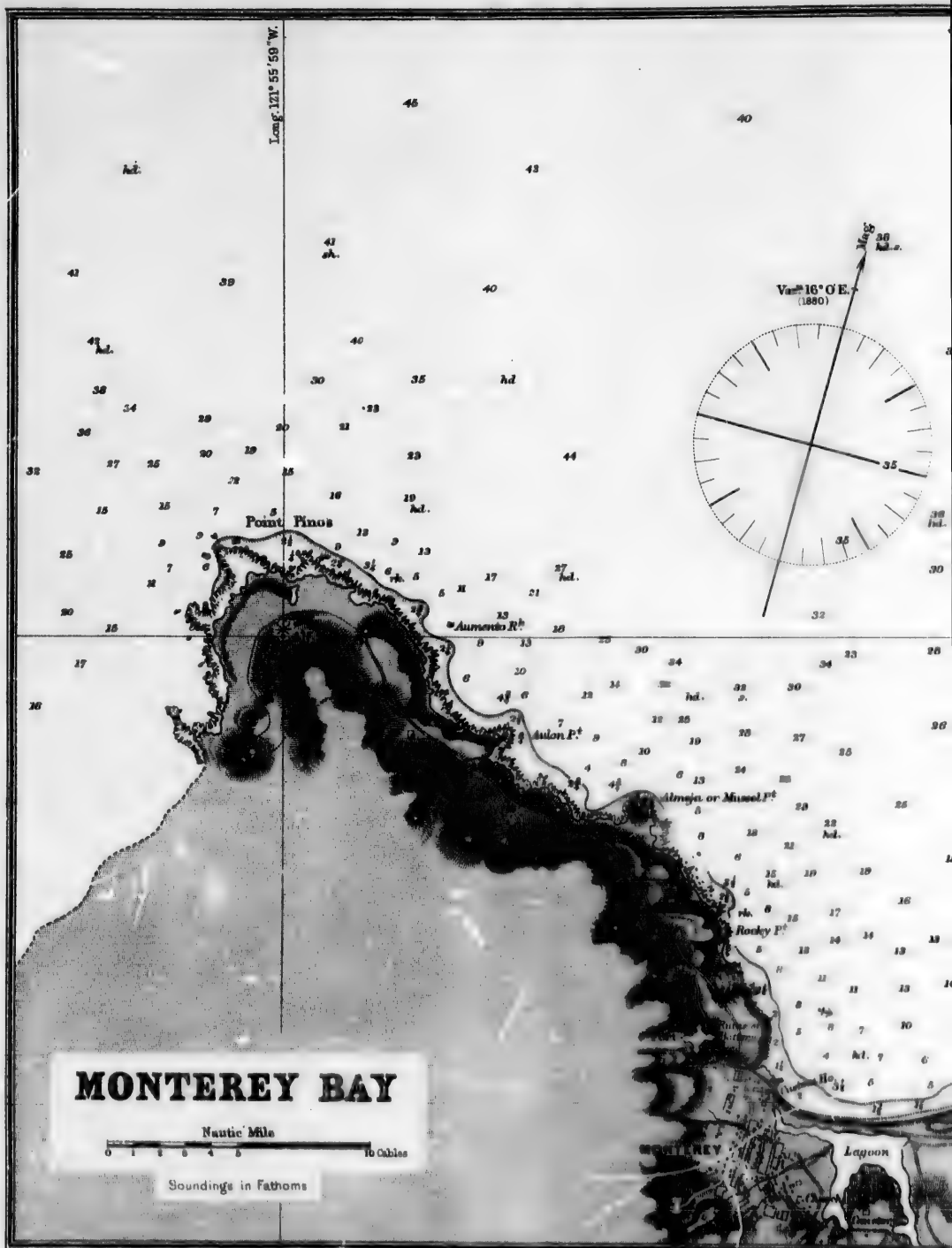
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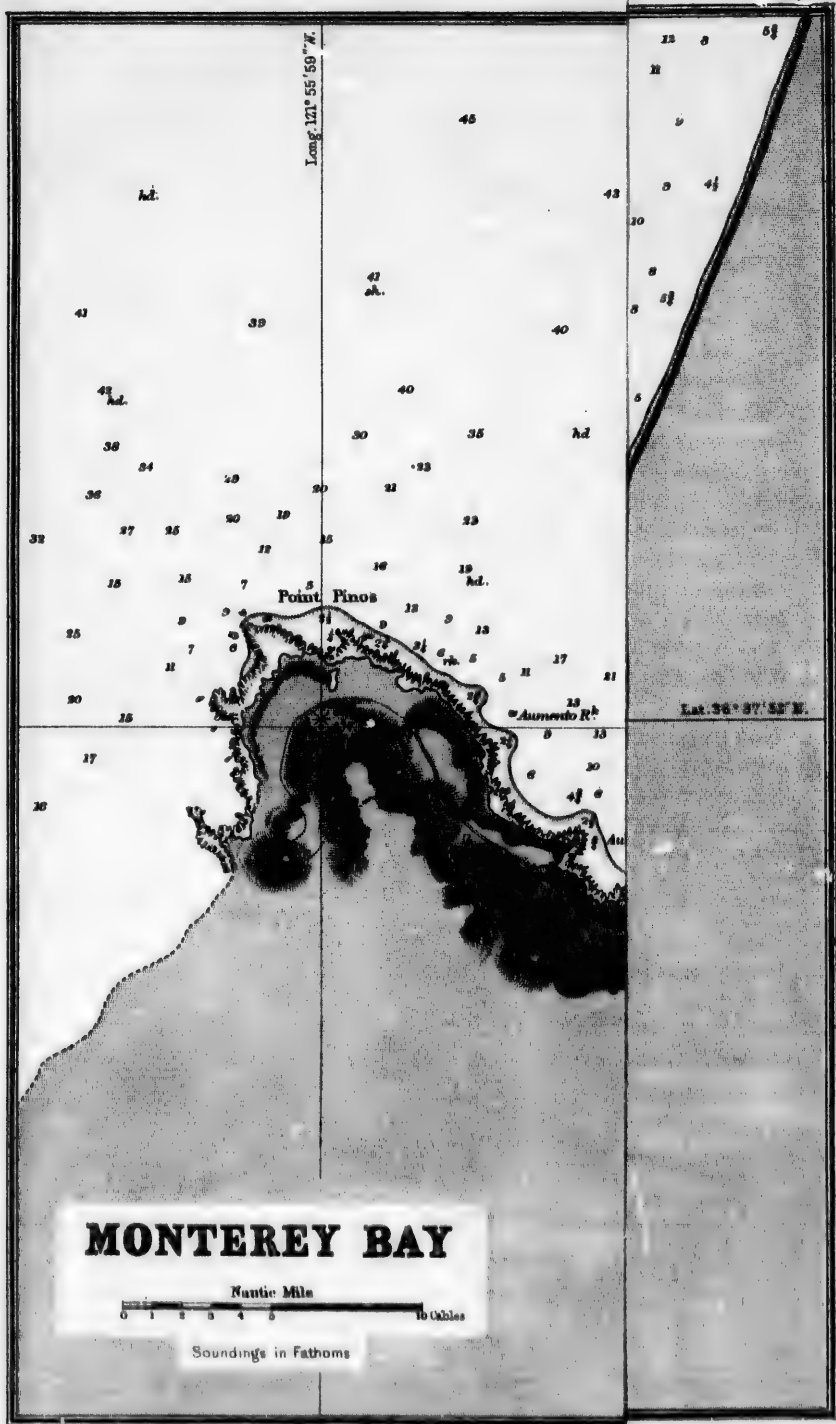
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Point Pinos Light.—The lighthouse upon point Pinos is 35 feet high, and shows a *fixed* light, at 91 feet above the sea, visible 15 miles. Its geographical position is lat. $36^{\circ} 37' 52''$, long. $121^{\circ} 55' 59''$.

MONTEREY BAY.—Point Pinos forms the south-west point of this bay, and point Santa Cruz (the western point of the anchorage of Santa Cruz), the north-west point. A line joining these two points runs N. 27° W., $19\frac{1}{2}$ miles, and the greatest width of the bay, near the mouth of Salinas river, $9\frac{1}{2}$ miles.

The only part of Monterey bay in which vessels can anchor in security is near its southern part, off the town, at about 3 miles south-eastward from point Pinos, where is good riding, and tolerable shelter for a few vessels. In order to be protected from the sea, it is necessary to lie at no great distance from the south-west shore, whence, either at night or in the morning, the prevailing wind from the land permits vessels to leave the bay, which otherwise would be a tedious task, by the opposition of the wind along the coast, the general direction of which is between N.W. and N.N.W. To these points of the compass the anchorage is wholly exposed, but as point Pinos to some extent protects it from the swell of the sea, and these winds seldom blow stronger than a moderate gale, the anchorage is tolerably safe and convenient; notwithstanding north-westerly winds are common throughout the greater part of the year, there are few instances known of their being so violent as to affect the safety of vessels tolerably well found in anchors and cables. The soundings are regular, from 30 to 4 fathoms, on a bottom of sand and mud; and, the shores are sufficiently steep for all the purposes of navigation,—without rocks or any known sunken dangers.

From point Pinos to the anchorage off the town of Monterey, the course is E. by S. $\frac{1}{2}$ S. The shore towards the town is rugged, composed of granite, and covered with a heavy growth of fir; but eastward of the town is a long, sandy beach, backed by sand dunes of slight elevation. For a distance of 10 miles along this beach the line of 3 fathoms lies at a distance of 150 yards from the shore, the water deepening rapidly beyond that, and the bottom almost everywhere hard.

Vessels approaching Monterey from *northward*, should follow the coast from point Año Nuevo to point Santa Cruz, then run well into the bay, but not too far, for fear of losing the wind, and to avoid the set of the heavy swell rolling towards the beach. Leaving point Santa Cruz and keeping on a S.E. by E. course about 15 miles, will bring them into 25 fathoms, and nearly 2 miles from the beach; thence a South course for 8 miles will bring them to the anchorage in 10 fathoms, and half a mile from the landing. These precautions are necessary, because point Pinos, with the whole bay, is almost continually enveloped in a dense fog. Very frequently the coasting steamers have to run for the beach, and then be guided by the route to the anchorage.

A direct course from point Año Nuevo to the anchorage is S.E. $\frac{1}{2}$ E., and the distance $36\frac{1}{2}$ miles. From point Pinos to point Año Nuevo the bearing is N.W. $\frac{1}{2}$ W., and distance 84 miles.

By anchoring well in at the western side of the anchorage vessels will avoid much of the swell that comes in with the heavy north-west winds, but never sufficient to make any berth there dangerous. In heavy southerly weather point Pinos breaks the swell, but the wind draws very strong over the anchorage. The water shoals from 15 to 3

fathoms in a distance of 800 yards, and the lead should be used to avoid running in too far.

When the California mail steamships stopped at Monterey they frequently ran outside of point Pinos, or in very dangerous proximity to it. This led to their firing a gun when approaching the harbour during foggy or dark weather, and upon the report being heard at the fort a gun was fired in answer, and the exchange kept up until the steamer was safe at her anchorage.

The approximate geographical position of the end of the wharf, abreast the custom-house at Monterey, is lat. $36^{\circ} 36' 17''$, long. $121^{\circ} 52' 27''$.

Tides.—The corrected establishment of the port of Monterey is 10h. 12m. The mean rise and fall of tides is 8.4 feet; of spring tides 4.8 feet; and of neap tides, 2.5 feet.

The town of Monterey presents a very pretty appearance as seen from the water. Immediately behind it the country rises in plateaux, diversified by hill and valley, and beautifully dotted by oak groves. It was the capital of California while under the rule of Mexico, and for some years after it became a State.

Regular communication is kept up with all parts of the coast by steamers and numerous sailing vessels. Stages communicate with Santa Cruz and all the towns to San Francisco.

Captain Beechey R.N. (1827) says of Monterey—"The anchorage is in the south angle of the great bay extending between point Año Nuevo and point Pinos. It is necessary to lie close to the shore, both on account of the depth of water, and in order to receive the protection of point Pinos, without which vessels could not remain in the bay. It presents to the eye a very exposed anchorage, but no accidents have ever occurred to any vessel properly found in cables and anchors, in which respect it very much resembles the bay of Valparaiso, nearly in the same parallel in the southern hemisphere.

The town and presidio of Monterey are situated upon a plain between the anchorage and a range of hills covered with woods of pine and oak. At the distance of a league to the southward of the presidio lies the mission of San Carlos, situated in a valley near the river Carmel,—a small stream emptying itself into a deep rocky bay. The shores of the bay, and indeed of the whole of the coast near point Pinos, are armed with rocks of granite, upon which the sea breaks furiously; and, as there is no anchorage near them on account of the great depth of water, it is dangerous to approach the coast in light or variable winds. Fortunately some immense beds of sea-weed lie off the coast, and are so impenetrable, that they are said to have saved several vessels which were driven into them by the swell, during calm and foggy weather.

Ships should not enter the bay in light winds in any other part than that used as an anchorage, as there is generally a heavy swell from the westward, and deep water close to the shore.

It is impossible to mistake point Pinos, if the weather be at all clear, as its aspect is very different to that of any part of the bay northward of it. It is a long, sloping, rocky projection, surmounted by pine-trees, from which it takes its name; whereas the coast line of the bay is all sandy beach. There is no danger in approaching point

Pinos, except that which may ensue from a heavy swell almost always setting upon the point, and from light winds near the shore, as the water is too deep for anchorage. With a breeze from southward, point Pinos should be passed as closely as possible; a quarter of a mile will not be too near; and that shore should be hugged in order to fetch the anchorage. In case of having to make a tack, take care to avoid a shoal at the south-east angle of the bay, which may be known by a great quantity of seaweed upon it; there is no other danger. This shoal has $8\frac{1}{2}$ and 4 fathoms upon its outer edge, and 7 fathoms near it. With a fair wind steer boldly towards the sandy beach at the head of the bay, and anchor at about one-sixth of a mile off shore in 9 fathoms, the fort upon the hill near the beach bearing W.S.W., and moor with the best bower to the E.N.E.

This anchorage, although apparently unsafe, is said to be very secure, and it is also stated that the only danger is from violent gusts of wind from the S.E. The north-westerly winds, though they prevail upon the coast, and send a heavy swell into the bay, do not blow home upon the shore; and when they are at all fresh they occasion a strong off-set in the bay. This I believe is also the case at Callao and at Valparaiso to which, as before mentioned, this anchorage bears a great resemblance.

There is no good water to be had at Monterey, and ships in want of that necessary supply must either proceed to San Francisco, or procure a permit from the governor, and obtain it at Santa Cruz, or some of the missions to the southward. There is very little current at the anchorage."

Monsieur Du Petit Thouars of the French navy 1887, says of Monterey—"When making the bay, it will be known by a depression in the coast, while the land rises to an elevation of more than 3000 feet at the northern and southern extremities. When in the latitude of point Pinos ($36^{\circ} 39'$), and near the shore, great white spots are seen westward of the point, which render it sufficiently marked. To anchor, with a fair wind, run in to within 2 or 3 cables' length of the rocks seen from this low point, and follow at the same distance the western coast of the bay, until point Pinos is shut in by point Almeja. You are then in 15 or 16 fathoms water, on a bottom of sand and a little mud, with good holding ground; that is the anchorage for large vessels.

Small vessels run in nearer to the bottom of the bay, and anchor very nearly in a range with the battery, in 9 or 10 fathoms water, on a bottom of muddy sand, having point Año Nuevo (the northern extremity of the bay) shut in by point Almeja. On account of the calms, which frequently oblige vessels to anchor, it is necessary to follow the western shore of the bay, neither too far off nor too near. During adverse winds, vessels may safely beat about in the bay of Monterey, as the two coasts are safe, the only danger being in the bottom of the bay, in the south-east anchorage. This is a bank of rock, on which are from 4 to 10 fathoms of water; but it is shown by the kelp which floats on the surface. Fogs are very frequent, and sometimes render it difficult to make the land; and it often happens that it is foggy in the offing but clear near the coast. During the rainy season (from November to March), the wind blows from S.E. to S.W.;—S.E. is the wind of bad weather.

During the dry season (March to November), the winds blow generally from N.W. to North:—N.W. is the wind for good weather. The N. wind causes a heavy swell in

the bay, but it is frequently less severe than in the offing. There is no perceptible current in the bay. Outside it the currents are not strong, and appear to run northward near the coast, and southward more in the offing."

The Shore of Monterey Bay.—From the town of Monterey northward the shore presents a uniform sand-beach running nearly North, backed by low dreary sand-dunes, producing sparsely the coarsest grasses and bushes, and entirely destitute of fresh-water. This waste extends to Salinas river, of which we reach the great bend at about $9\frac{1}{4}$ miles from Monterey, and only 100 yards from the beach; from point Pinos this bend bears N.N.E. $\frac{1}{2}$ E., distant $8\frac{1}{4}$ miles. From this bend the river follows the line of the beach, just inside of the low sand-dunes, for a distance of $4\frac{1}{4}$ miles, and then disembogues. This river rises in the latitude of the Piedras Blancas; one branch about 20 and the other 38 miles from the coast. These branches meet at San Miguel, and thence the streams run parallel with the coast and behind the Sierra Santa Lucia. From its mouth, which is only 60 yards wide at low water, to the entrance of the river Pajaro, the distance is $2\frac{1}{4}$ miles; the shore trending to the N.N.W.; the entrance of that river bears N. by E., 14 miles from point Pinos.

From the river Pajaro the coast runs N.W. nearly straight to Atos creek, a distance of 7 or 8 miles; this creek is about 6 miles E. by N. from Santa Cruz, and the shore between is rocky and steep.

North of Salinas river commence rich meadow and table lands, affording spots unsurpassed for productiveness, even in the prolific state of California.

A remarkable sub-marine valley, similar to that off point Hueneme (in lat. $34^{\circ} 10'$) has been discovered in this bay, and to some extent traced out. The head of the valley is five-eighths of a mile south of the mouth of Salinas river, and the 20-fathom line is at only a quarter of a mile from the beach, the depth increasing to 50 fathoms in the next quarter of a mile. At this distance from the shore the 20-fathom lines are three-eighths of a mile apart. The general direction of the valley for the next 2 miles is S.W. $\frac{1}{2}$ W. where is a depth of 117 fathoms, and the 50-fathom lines lie about five-eighths of a mile apart; thence the valley runs about West, reaching a depth of 170 fathoms in a mile, and 240 fathoms in $3\frac{1}{4}$ miles, with 42 fathoms less than a mile to the north of this. The soundings as yet are not numerous enough to trace its outlines in deep water; but the indications are that, for 10 miles of its length, it runs S.W. by W. $\frac{1}{2}$ W., with no bottom at 315 fathoms. The only available boat landing upon the beach of the bay shores is at the head of this sub-marine valley. There are no indications on the land of this peculiar formation, except that at its head the bay very gradually reaches its greatest easting.

An extensive valley, called the Salinas plains, through which flows Salinas river, extends inland from the eastern part of Monterey bay, nearly to the mission of San Miguel, situated on a plateau of the San Bruno mountains. This valley is said to be nearly 90 miles in length, and in breadth varying from 2 to 10 miles. It contains some 200,000 acres of good agricultural lands, and the remainder affords excellent pasturage for horned stock, horses, and sheep.

SANTA CRUZ.—This harbour or anchorage is at the north-west part of the bay of Monterey, and is of very limited extent. It is protected from all the winds from north-

ward, but exposed to the full sweep of southerly gales, and many coasters have been driven ashore during the winter season. It is about three-quarters of a mile in depth northward, by $1\frac{1}{4}$ miles east and west.

Vessels coming from *northward*, after leaving point Año Nuevo, follow the coastline on a general course E.S.E. for about 18 miles. The shore for this distance is steep, rugged, and moderately elevated, with a range of high hills or mountains, whose summits in summer are almost continually enveloped in fog. Skirting the shore at a distance of half a mile a depth of 6 to 10 fathoms can be carried, and upon making point Santa Cruz, the top of which is moderately level for some distance back, soundings of 4 fathoms are obtained within a quarter of a mile of it; round up and run along in 5 fathoms until abreast of the beach, where good anchorage will be found at half a mile from shore.

Vessels from *southward* in summer keep well into Monterey bay, to escape the full force of the north-westers and the heavy head sea.

During the winter months it is recommended to anchor well out, so as to be able to clear the shore westward of point Santa Cruz in case a south-easter springs up.

Landing on the beach is generally disagreeable, as it extends out some distance, but boats usually land at the embarcadero, at the foot of the bluff in the N.W. part of the harbour.

The beach is over half a mile in length, and between its eastern extremity and the bluff point empties the San Lorenzo river, a small stream running past the town and mission, which is situated a mile inland.

The country about Santa Cruz is exceedingly productive, and now thickly settled. A steamer runs regularly in the trade between this place and San Francisco, and numerous coasters find abundant freight from here and the Pajaro country to San Francisco. Regular stage communication is also maintained with San Francisco and Monterey.

Light.—At about 100 yards from the extremity of Santa Cruz point is a small square tower, from which is exhibited a *fixed white* light, at 69 feet above the sea, visible 14 miles. Its geographical position is lat. $36^{\circ} 56' 56''$, long. $122^{\circ} 1' 33''$.

The high mountain, N. 25° E. $12\frac{1}{4}$ miles from Santa Cruz, is named mount Bache, and attains an elevation of 8701 feet.

Tides.—The corrected establishment of the port is 10h. 18m. The mean rise and fall of tides is 4.1 feet; of spring tides, 5.5 feet; and of neap tides, 2.9 feet.

THE COAST.—From point Santa Cruz to point Año Nuevo the distance is 18 miles, and the general direction is W. by N. $\frac{1}{4}$ N., at first curving to the south-westward of that course, and then to the northward, until within 8 miles of the rock off point Año Nuevo, when the shore curves well to westward (for the last mile to the south-west), and forms an anchorage protected somewhat against the heavy swell from the north-west, in which is a depth of 5 fathoms within less than half a mile of the shore, and 10 to 15 fathoms at the distance of a mile.

At a quarter of a mile from the point lies a black rugged islet, consisting of a sloping ledge of rocks covered with a stratum of yellow clay about 4 feet thick, and this

again covered with a mound of sand about 80 feet high.* The point itself is composed of hills of shifting sand, varying from 20 to 100 feet in height, while behind them rises the Santa Cruz range of mountains.

Steamers coming upon the coast from southward in thick weather, always endeavour to make the land near point Año Nuevo, and then follow the coast to San Francisco bar.

From point Año Nuevo the coast trends north-westerly about 5 miles to Pigeon point, 2 miles beyond which is a rocky point named Bolsa. The high mountain (Black mountain) eastward from point Bolsa, bearing N.E. $\frac{1}{4}$ E., distant 18 miles from the point, attains an elevation of 2809 feet.

Pigeon Point Light.—On the extremity of Pigeon point, in lat. $37^{\circ} 10' 46''$, long. $122^{\circ} 28' 36''$, a light, *flashing* every 10 seconds, is exhibited from a conical brick tower, painted white. The light is 150 feet above the sea and visible 18 miles. A steam fog-whistle, 100 feet west of the tower, gives blasts of 4 seconds duration, with alternate intervals of 7 seconds and 45 seconds.†

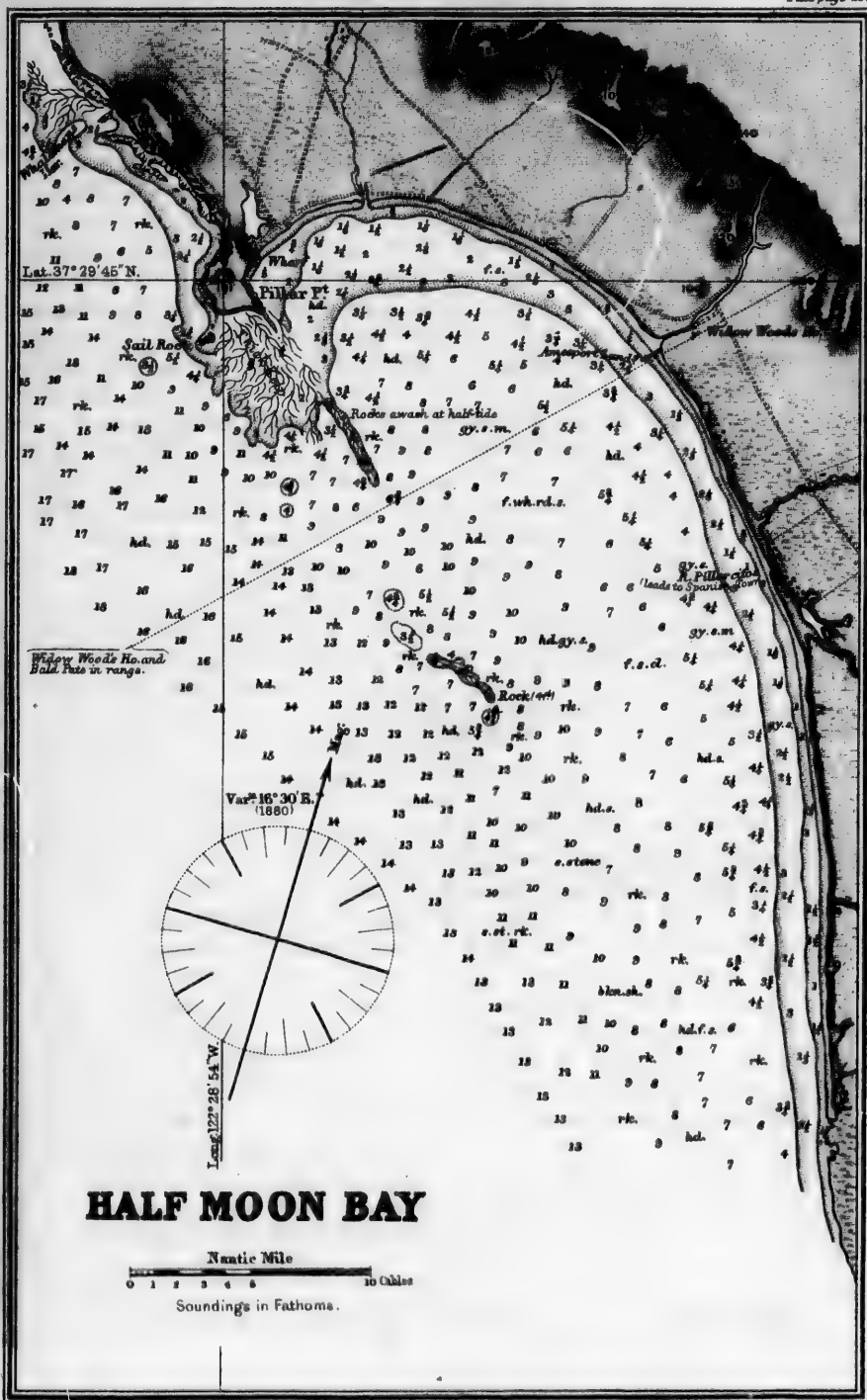
Two miles north of Bolsa point is the mouth of the Pescador, a small stream running through a valley of inconsiderable extent.

From Bolsa point to Pillar point, forming the south and western point of Half-moon bay, the general direction is N.W. by N. $\frac{1}{4}$ N., and the distance 18 miles. At $8\frac{1}{2}$ miles above the Pescador is the San Gregorio, another small stream, and $2\frac{1}{2}$ miles still farther is the Tunitas. The seaboard between the valley of the Pescador and that of the San Gregorio undergoes a striking change: instead of table land we meet with a spur of the coast mountains running into the sea, and having an elevation of 600 feet within a mile of it. The shore-line and the coast generally presents a very broken and rugged appearance, occasioned by the deep gulches cut through to the ocean.

HALF-MOON BAY.—This anchorage is 6 miles S.S.E. from point San Pedro, and 18 miles S. by E. from the Golden gate. The south-western point of the bay is formed by a bluff table-land about 160 feet in height, called the Corral de Tierra, 825 yards south of which stretches a number of black rocks, which show as one when seen coming up the coast, but as three or four when approached from north-westward; the largest is nearly as high as the bluff, and locally known as Sail rock, or Pillar rock. The point is known as Pillar point, and from its south-eastern extremity rocky and foul-bottom, marked by kelp, extends S.E. $\frac{1}{4}$ E., seven-eighths of a mile, dropping suddenly from 14 feet to 5 fathoms; this is the inner reef, and makes the bay available as a summer anchorage. At $1\frac{1}{4}$ miles south-east from the same part of the point a narrow ledge of rocky bottom, a third of a mile long, and marked by kelp, stretches in the same general direction. The passage between this outer and the inner reef is three-quarters of a mile wide, with rocky and uneven bottom, from $8\frac{1}{4}$ to $10\frac{1}{4}$ fathoms. These ledges lie parallel with the coast mountains, and with the shore-line from which

* On the seaward side of Año Nuevo island (in lat. $37^{\circ} 6' 42''$, long. $122^{\circ} 19' 51''$) a steam fog-whistle is established, which during foggy weather is sounded for 15 seconds at intervals of 45 seconds.

† Pigeon point is about 88 miles south of "The Golden Gate," and 25 miles north of Monterey bay. Farallon light bears N.W. by W. $\frac{1}{4}$ W. distant 42 miles; point Pinos, S.E. $\frac{1}{4}$ E. 89 miles.



the outer one is distant $1\frac{1}{2}$ miles. From the eastern extremity of the point the shore runs N.W. by N. for a quarter of a mile; then N.E. for three-quarters of a mile, curving to the eastward and south-eastward in a long bend, for $2\frac{1}{2}$ miles to the mouth of the Arroyo de los Pillarcitos, down which comes the only road crossing the peninsula of San Francisco, between the Laguna de Mercedes and Santa Cruz. The highest part of this road, which crosses a depression of the peninsula, is near the Coast Survey station "Ridge," which is 1093 feet above the ocean, and but a few feet higher than the road. The outer reef is nearly abreast of the Pillarcitos, from which the coast runs South 4 miles to Miramontes point, which is S. 48° E., 5 miles from Pillar point; thence to the mouth of the Tunitas the distance is 4 miles S.E. The greatest extent of the bay may be said to be between Pillar and Miramontes points, but the part near the former only is available.

The soundings between the rocky ledges and the shore are quite regular, decreasing from 9 fathoms to 3 fathoms at less than a quarter of a mile from the beach, with sandy bottom. The passage to the anchorage is between the inner and outer reef, with the high, bare-topped mountain bearing a little north of East, and Pillar point open to the westward. This mountain is steep, with straggling redwoods on its flanks, and the summit bare. It is locally known as Bald Pate; but, on the Spanish grants, as Cumbra de las Auras. When inside the reefs beat up until Pillar point bears about S.W., distant half a mile, and anchor in $4\frac{1}{2}$ fathoms hard sand. With southerly light winds a heavy swell sets in; but upon the approach of heavy south-east weather it is necessary to go to sea.

The mass of redwoods cresting the mountains of the peninsula cease abruptly abreast of Miramontes, and only stragglers are seen to the northward. They are a good mark for recognizing this part of the coast when coming in from sea.

Around Half-moon bay is a limited extent of agricultural country at the seaward base of the mountains, and small coasters carry the produce to San Francisco.

About one mile along the coast to the north-westward is a small boat harbour, 100 yards wide, formed and protected by outlying rocks, and having $8\frac{1}{2}$ fathoms in it. In the autumn months it is used as a whaling station.

Point San Pedro lies N.W. by N. $\frac{1}{4}$ N., 30 miles from point Año Nuevo, and S. by E. from point Lobos, at the entrance to the Golden gate. It is a black, bold, rocky promontory, over 500 feet high, having a high, large, rugged rock at the northern part, and is a prominent and excellent mark for making the entrance to San Francisco. The principal rock is nearly 100 feet high; its south face is white, and shows the lines of stratification plainly;—it is connected with the main by some low rocks. Half a mile to the north-east of the point is the valley of San Pedro, from which the point takes its name.

Fog-whistle.—A steam fog-whistle is established on Montara point, in lat. $37^{\circ} 32' 2''$, long. $122^{\circ} 31' 9''$; during fog it is sounded for five seconds, with an interval of 25 seconds, then a blast of 10 seconds, followed by an interval of 20 seconds. It is distant $8\frac{1}{2}$ miles S. by E. $\frac{1}{4}$ E. from point San Pedro, and $2\frac{1}{2}$ miles N.W. by N. from Pillar point.

The range of mountains forming the north-eastern shore of Monterey bay, and

extending to Santa Cruz and point Año Nuevo, is named Santa Cruz. Thence northward to the Golden Gate, and forming the peninsular of San Francisco, by bounding the bay on the west, the mountains are known as the San Francisco or San Bruno range.

The extent of shore line from point Concepcion to point Bonita is about 286 miles.

BAY OF SAN FRANCISCO.—This bay affords the finest and most commodious harbour on the Pacific coast of the United States. From its discovery it has commanded the admiration of navigators, and, since the wonderful rise of California has well sustained its reputation. Its geographical position, its size and depth of water, its noble entrance and bold shores, the Sacramento and tributaries, draining the rich agricultural valleys and auriferous slopes of the Sierra Nevada, the prosperous city upon its shores, and the salubrity of its climate, have conspired to make it emphatically the port of the Pacific.*

The entrance to the bay is known as the Golden Gate; it presents the character of a great cleft or fissure in the sea-coast range of mountains, thereby connecting the bay of San Francisco with the Pacific ocean. On approaching, it is difficult to imagine that a deep channel lies ahead, so clear is the atmosphere, and so well defined the Contra Costa mountains, behind the bay. Both shores are bold, broken into points, and rocky; but the northern is much the bolder, rising almost perpendicular from the water, attaining an elevation of about 1000 feet, but a short distance back, and in 7 miles rising to 2600 feet. On the south side, between the points, are stretches of low beach; the hills are undulating and of moderate elevation, increasing very gradually in altitude to the southward, and reaching a height of 1250 feet in about 6 or 8 miles.

Point Bonita and Light.—The north head of the entrance is formed by this point; a narrow, precipitous, rocky cape, nearly 800 feet high, and stretching from the lighthouse about half a mile to the S.E. Behind it the mountains rise rapidly to an elevation of 1500 feet. During the dry season the deposit of sea birds accumulates in such quantities on the ridge outside point Bonita lighthouse, as to make the bluff show white, but the first heavy rain carries it off, and then, throughout the rainy season, the point exhibits its natural colour and appearance. There are no dangers off the point, the line of 3 fathoms rarely extending 300 yards from any portion of it. When the clipper ship *San Francisco* was lost on this head, we are told that she first struck the bluff inside the heads; was carried by the currents around the point, and then cast ashore on the outside. A depth of from 5 or 6 fathoms can be found on every side of the point within 2 cables.

The new lighthouse on point Bonita is situated on the extremity of the point, and consists of a brick tower painted white. It shows a *fixed* light at 806 feet above the sea, visible 18 miles. Its position is lat. $37^{\circ} 48' 48''$, long. $122^{\circ} 31' 44''$. From this light to that on Fort point the distance is $2\frac{1}{2}$ miles, and the bearing E. $\frac{1}{4}$ N.

The old light-tower, white, is about a quarter of a mile northward of the new building and is used as a day-mark only.

Upon point Bonita is a fog-signal house stationed behind the new lighthouse. It is

* See the large plan of the bay of San Francisco on the chart of the coast of California published by Messrs. Imray and Son.

provided with a powerful siren trumpet, which during foggy weather is sounded for 14 seconds, at intervals of 85 seconds.

Point Lobos.—The south head of the entrance to San Francisco bay is formed by this point, which is 875 feet high. Upon the round-topped hill behind the point is a telegraph station, having connection with the city of San Francisco. Southward of the head the sand dunes are conspicuous and easily recognised features in approaching the entrance. The quantity of sand driven in from this beach by the strong N.W. winds of summer is enormous, and its accumulation has greatly modified the topography of the peninsula.*

Off the western face of point Lobos lie a number of black rugged rocks about 50 feet high, but all within the 5-fathom line, and close in shore. They are known as the Seal rocks, and one of them shows a large arch from particular directions. The outer one bears from point Bonita S.E. by S. $\frac{1}{2}$ S., and is distant $2\frac{1}{2}$ miles. From it the shore runs in a north-easterly direction for nearly a mile, to a short jutting high point, off which lie the Mile rocks. From this point the shore runs well to the eastward for a mile, gradually trending to the north for $1\frac{1}{2}$ miles to Fort point. In the deepest part of this bend the shore is low, with small hillocks rising from the general surface and slope of the hills, and fronted by a long sand beach.

The Mile rocks are two small islets lying near each other, and having a height of 15 feet above water, with a good depth of water all around and close to them; but the current whirls and eddies about them in such a manner as to render a near approach anything but agreeable or safe with a light wind. The inner and smaller rock is a third of a mile northward of the small jutting point inside of point Lobos, and very nearly 2 miles S.W. $\frac{1}{2}$ S. from Fort point. Vessels running in on the line of Fort point and Alcatraz island pass less than half a mile from the outer and larger rock. The rocks bear almost S.E. from Bonita light, distant $1\frac{1}{2}$ miles.

Fort Point and Light.—This promontory is but a few feet above high water; upon it is a large fortification, which is mounted with guns of the largest range and calibre. Upon the hillside rising behind it are houses for the accommodation of the soldiers, &c. Eastward of the point is a wharf for receiving stores and ordnance.

Several large vessels have been lost on Fort point by venturing too close during light airs and strong irregular currents. Two rocks, dangerous to navigation, have been discovered lying near the point; a red buoy is moored outside them.†

* We believe it is intended to erect a lighthouse on point Lobos.

† The positions of two dangerous sunken rocks off Fort point, at the entrance to San Francisco harbour, have been determined as follows:—

The first rock lies 340 feet off shore, N.W. by N. from Fort Point lighthouse, with 9½ feet on it and 3 fathoms close to it, the water deepening to 7 fathoms at a distance of 500 feet outside.

The second rock lies 360 feet off shore, N.E. by N. $\frac{1}{2}$ N. from Fort Point lighthouse, with 11 feet on it and 4 fathoms close to it, the water deepening very rapidly outside. A rock, bare at low water, lies half way from the second sunken rock to the shore, and nearly in range with the eastern edge of the fort; and another, bare at low water, 300 feet W. $\frac{1}{2}$ S. from the latter.

It will be apparent that these sunken rocks are well inside the fair-way of the channel: but they are especially dangerous on account of the violent eddies of the tidal current which prevail in the vicinity of the point, a close approach to which should be carefully avoided. (1874).

Upon Fort point is a lighthouse which shows a *fixed* light varied by *red flashes*, at 88 feet above the sea, visible 15 miles; the angle of visibility seaward is bounded by the extremity of point Bonita bearing W. $\frac{3}{4}$ S., and point Lobos bearing S.W. by S. $\frac{1}{4}$ S. The light is *fixed white* for one minute, followed during the next minute by *four consecutive red flashes*. Its geographical position is lat. $37^{\circ} 48' 31''$, long. $122^{\circ} 28' 36''$.

A fog-bell is stationed on the bastion of the fort. During foggy weather it is struck at intervals of 10 seconds.

San Francisco Bar.—The least depth on the bar off the entrance to the bay of San Francisco is $4\frac{1}{2}$ fathoms (1874) at the lowest tides. Its general form is that of a horse-shoe, commencing 4 miles southward, stretching out gradually to 6 miles abreast point Lobos; and when nearly up to the parallel of point Bonita, running in shore towards that point and forming the "4-fathom bank," from a distance of 4 miles down to one. The average breadth of the bar within the limits of the 6-fathom curve is about 2 miles. It falls off outside to 12 fathoms in half a mile, and deepens gradually inside. The depth over the bar when point Bonita light bears between N.E. by E. $\frac{1}{4}$ E. and N. by W. $\frac{1}{4}$ W. is not less than $4\frac{1}{2}$ fathoms.

No vessel should anchor upon the bar if it can possibly be avoided; frequently a heavy swell sets in without wind, and if the current is running strong ebb, it allows little chance of escaping from an uncomfortable berth.

The flood tide makes on the bar about 61 minutes earlier than at San Francisco.

Three fairway buoys are placed as a guide for vessels crossing the bar; they are in line with Fort point, bearing N.E. $\frac{3}{4}$ E. The outer buoy, *black and white*, is outside the bar, in $13\frac{1}{2}$ fathoms, 10 miles distant from Fort point; it carries an automatic fog-whistle. The middle buoy, *black and white*, is in $9\frac{1}{2}$ fathoms water, $5\frac{1}{2}$ miles distant from the outer buoy. The inner buoy, *black and white*, is in 20 fathoms water, between Bonita and Lobos points and distant $2\frac{1}{2}$ miles from the middle buoy.

The fog sometimes stands like a wall outside of a line from Fort point across the entrance, while the bay inside is beautifully clear. After the greatest heat of the day is passed this fog creeps in and envelopes land and water.

Four-fathom bank.—The shallow part of this bank, having a general depth of $3\frac{1}{2}$ and 4 fathoms, is about $2\frac{1}{2}$ miles in extent, east and west, and nearly a mile in width. Its eastern extremity is about a mile westward of Bonita point; the channel between has a depth of 8 to 10 fathoms and is frequently used when the bar is impassable. Two *black* buoys mark the bank; the east buoy lies in $5\frac{1}{2}$ fathoms, W. by S. $\frac{1}{4}$ S. $1\frac{1}{2}$ miles from Bonita point; the west buoy, off the west end of the bank, lies W. by S. $\frac{1}{4}$ S. $8\frac{1}{2}$ miles from the east buoy. The west buoy is not to be depended on.

Golden Gate.—On the north side of the Golden Gate the shores are very precipitous, with an occasional short stretch of sand beach at the base of the bluffs, affording a boat landing. Point Diablo is the first point inside Bonita, and bears N.E. by E. $\frac{3}{4}$ E. distant $1\frac{1}{2}$ miles from it; between these the shore is indented about three-quarters of a mile, affording a boat landing during smooth weather for the lighthouse people. In the vicinity of Diablo the faces of the cliffs show of a reddish purple colour. The

red specks found on the bar are doubtless derived from the disintegration of these reddish cliffs.

From point Diablo the shore is rugged and irregular to Lime Point bluff, 495 feet high, distant one mile, and bearing N.E. $\frac{1}{4}$ E. Off this point are several high rocks, but they are so close to the bluff as to be distinguishable only from certain directions. From Lime Point bluff to Fort point the distance is barely a mile, and the bearing S. by E. $\frac{1}{4}$ E. This is the narrowest part of the Golden Gate. Thence the bay begins to open well to the north-east.

On the south side, eastward from Fort point, the shore is low, flat, and marshy to point San José, distant $2\frac{1}{2}$ miles, and bearing E. by N. This point is moderately high, with a few houses clustering upon it, and is locally known as Black point. Off this reach was the 'outer anchorage' of former navigators, and the Presidio of San Francisco is seen a short distance behind it.*

From point San José to North point, at the base of Telegraph hill, the distance is one mile, and the bearing E. $\frac{1}{4}$ N. All this space forms part of the city of San Francisco, and is covered with houses. The shore-line is denominated the North beach, and from about the middle of the lowest part projects a long wharf over the flats to 8 fathoms water. This has naturally caused a great deposit around it, and now only $4\frac{1}{2}$ feet of water can be obtained at the north-west part of the wharf at mean low water.

Telegraph hill rises to a height of 301 feet above the level of the bay, and is covered with houses to its summit wherever building room can be obtained. The position of the hill is considered to be lat. $37^{\circ} 48'$, long. $122^{\circ} 23' 10''$.

Upon this hill was formerly a telegraph or semaphore, by which intelligence of the arrival of vessels off the Golden Gate was made known to the city—hence the name of the hill. In 1875 the summit of the hill was given to the City of San Francisco for the purpose of a pleasure resort.

Alcatraz Island and Light.—This, the first island that is opened in entering the Golden Gate, is nearly 600 yards long, in a W.N.W. direction, by about 260 in width, and rises to an elevation of 135 feet above high water. The summit is flat, falling away gently on all sides for some distance, and then at the sides dropping perpendicularly. Deep water marks exist all round the island, and, with the exception of one or two places, the sides are so steep that a landing is effected with difficulty. Extensive

* "It is a curious and interesting fact that the sand beach between Fort point and point San José has been thrown up by the surf upon an extensive alluvial deposit, which has the character of a peat bog or swamp. When the tide is very low the edge of this peat formation may be seen. Large masses of the peat are also broken out during storms, and thrown up on the sand of the beach. This sand and all the loose round boulders, from 3 to 8 inches, or more, in diameter, rest upon a foundation of the peat; and the continuation of the peat is found in the swamp or flat meadow land which lies inside the belt of sand, and between it and the base of the sandstone hills. It is very difficult to account for the formation of this swamp under conditions like those at present existing.

A strong current is constantly setting backward and forward through the channel, and the action of the surf constantly undermines and encroaches upon the beach, so that the present action is destructive, and the swamp could not possibly have been formed while the Golden Gate was open as we now find it." *Geological Report of the coast of California*, by W. P. Blake, Esq.

fortifications are in course of construction upon it. At the south-east side a small pier has been built to receive stores, ordnance, and materials. Off the north-west part, foul bottom makes out about $1\frac{1}{2}$ to 2 cables.

The lighthouse on the summit of the island bears N.W. from Telegraph hill, distant $1\frac{1}{2}$ miles; and from Fort point N.E. $\frac{1}{2}$ E., distant nearly 8 miles. It exhibits a fixed light at 166 feet above the sea, visible 14 miles; its position is lat. $37^{\circ} 49' 27''$, long. $122^{\circ} 25' 18''$.

On the south-eastern extremity of the island, close to the water's edge, is a fog-bell, which is about 80 feet above the water. During foggy weather it is struck four times at intervals of 9 seconds, followed by a pause of 28 seconds.

Shoals in the Entrance.—The following dangers occur inside the entrance, eastward of the line from Fort point to Lime Point bluff:—*

Presidio shoal, having $8\frac{1}{2}$ fathoms upon it, lies $1\frac{1}{2}$ miles inside of Fort point, and bears N.E. by E. $\frac{1}{2}$ E. from it. The shoal is about $8\frac{1}{2}$ cables long within the 4-fathom curve, and over half a mile long within the 5-fathom curve. It is very narrow, shows sandy bottom, and has deep water all round it. Its general direction is on the above mentioned bearing. From the shoalest part the Presidio flag-staff bears S. $\frac{1}{2}$ E. Near the middle of the shoal is a buoy, coloured *black* and *red* in bands.†

Anita rock shows above water at low tides, and is situated $1\frac{1}{2}$ miles inside of Fort point, and bears E. by N. from it. It is only $1\frac{1}{2}$ cables from the low beach, and has deep water close around it. An iron beacon, surmounted by a cage, is placed on the rock; it is painted *black* and *red* in bands. Vessels should not approach this beacon within a cable, as a strong current sets across the rock.

Bird or Arch rock is a small pyramidal rock, about 45 feet in diameter, 18 feet high, and bearing W. $\frac{1}{2}$ S., distant seven-eighths of a mile from the lighthouse on Alcatraz island. When seen in the direction from or towards the Presidio shoal, it presents a perforation at low tides.

* The following note was published in the year 1874:—In the recent survey of the San Francisco bar, several shoal spots were discovered, having about one fathom less than the average depth: and the line of best water across the bar was determined.

1. A small spot, with 4 fathoms, lies S. 54° W. distant 6 miles from Bonita lighthouse, and S. 27° W. 4.2 miles from Seal rock. A second spot, with the same water, lies W. $\frac{1}{2}$ N. 443 yards from the former.

2. A small spot, with 4 fathoms, lies S. 20° W. distant 6 miles from Bonita lighthouse, and S. 43° W. 4.2 miles from Seal rock. A second spot, with the same water, lies N.W. 545 yards from the former.

3. Off the west end of the "Four-fathom bank," a small spot, with 5-fathoms, lies S. 55° W. distant 5 miles from point Bonita, and S. 82° W. 5.5 miles from Seal rock.

The deepest water over the bar is when Alcatraz island is open a little more than its width from Fort point, where the bar is very narrow, and 6 fathoms can be carried over it.

† In the recent survey of San Francisco bay (1874) a ridge having less than 7 fathoms upon it was developed. The ridge stretches in an irregular curved line from the north-west point of Alcatraz island to the eastern end of the Presidio shoal, and has an average width of $3\frac{1}{2}$ cables within the 7-fathom line. The depth of water upon it is not regular, and the shoalest spot yet discovered has only 22 feet water upon it at low spring tides. This spot lies in the regular track of vessels and is a danger to those of large draught. It is about 100 yards long, and the water around it deepens gradually to 6 fathoms S. by W. and N. by E. It lies S.E. by E. $\frac{1}{2}$ E. 790 yards from Bird rock, and S.W. by W. $\frac{1}{2}$ W. 1260 yards from Alcatraz light.

Shag rock is a low white-topped rock, about half a mile nearly N.N.E. from Bird rock. From Alcatraz Island light it bears W. by N., distant one mile. For about $1\frac{1}{4}$ cables towards Alcatraz island the bottom is foul and irregular, but outside that limit 10 fathoms are found. The rock shows about 4 feet above the highest tides, being then not more than 8 or 10 feet in extent.

Blossom rock, a ledge having $22\frac{1}{2}$ feet water upon it at the lowest tides, lies almost midway between Alcatraz and Yerba Buena islands; it is about a cable in extent, within the 4-fathom curve, with deep water outside these limits. A buoy, coloured red and black in bands, is moored on the rock. Vessels should not approach this buoy from any direction nearer than 2 cables as there is a heavy tide-rip in the locality.

Yerba Buena and Light.—Yerba Buena is the large high island opened to the east and south of Alcatraz after entering the Golden Gate. The western point of this island bears N.E. by E. distant $1\frac{1}{4}$ miles from Telegraph hill. Its peak is 840 feet high; the sides steep and irregular, and rising to a ridge running nearly east and west. On the western or San Francisco side the water is very deep close in shore, but from the north-west point a 8-fathom bank extends $1\frac{1}{4}$ miles N.W. by N., spreading to the eastward for half a mile, and thence running to the north-east point. Close off the north-west side of the island this bank is very shallow, there being as little as one foot water in some places.

On the south-east extremity of Yerba Buena island a *fixed white* light is exhibited, at 97 feet above the sea, visible 15 miles. The lighthouse is a low hexagonal wood tower painted light-buff colour. Its geographical position is lat. $37^{\circ} 48' 17''$, long. $122^{\circ} 21' 45''$; from it Fort Point lighthouse bears W. by S. $\frac{1}{4}$ S. distant $5\frac{1}{4}$ miles.

In front of the lighthouse is a fog-signal station, at which a whistle is sounded for 4 seconds at intervals of 16 seconds during foggy weather. A bell is sounded till the steam is up for blowing the whistle.

Westward of Yerba Buena island, distant three-quarters of a mile, is the head of the Oakland railway wharf; the depth abreast the end of this wharf and in the channel between it and the island averages $8\frac{1}{2}$ fathoms.

Angel Island.—When passing through the narrowest part of the Golden Gate this large island bears about N.N.E., and is seen as an island for a very short time when in the narrowest part of the Golden Gate. It has an irregular and bold shore-line of about 5 miles, and an area of one square mile. It rises to a height of 771 feet, is covered with grass and bushes, and cut in every direction by deep gulleys. As seen from the south-eastward it appears part of the northern peninsula, but is divided from that on its N.W. face by Racecoo straits, three-quarters of a mile in width, having a depth of water ranging from 10 to 30 fathoms, and a very strong current. A narrow high jutting point makes out from the S.E. portion of the island, bearing N. $\frac{1}{4}$ W. from Alcatraz island light, and distant $1\frac{1}{4}$ miles. From this head the general trend of the southern face for over a mile is W. by S.

Sausalito.—Half a mile N.N.W. from Lime Point bluff is point Cavallo; the shore-line between these points falls slightly back, and a very small valley makes down from high hills behind. From point Cavallo the general trend of the shore is N.W. by N. for $1\frac{1}{4}$ miles to point Sausalito. One mile from point Cavallo is the anchorage of

Saucelito, where men-of-war and whalers formerly anchored. It lies abreast a few houses forming the town of Saucelito, whence much of the water used in San Francisco was formerly taken in steam water-boats. North of this anchorage is a large bay, with but a few feet of water. From Saucelito point to the western point of Angel island the distance is $1\frac{1}{2}$ miles, and the bearing N.E. by E. $\frac{1}{2}$ E. To Peninsula point, forming the south-western part of Raccoon strait, the distance is one mile, and the bearing N.E. $\frac{1}{2}$ E.

San Pablo Strait, about 6 miles northward of Angel island, is a deep channel, leading into St. Pablo bay, between San Pedro and San Pablo points; it is about $1\frac{1}{2}$ miles wide and 8 to 16 fathoms deep. From San Pablo strait to Mare island, at the junction of the Mare and Karquines straits, the distance is about 10 miles in a north-easterly direction. The numerous dangers in the vicinity of San Pablo strait and in the channels between it and the Golden Gate may best be understood by inspecting the large plan of San Francisco harbour (Admiralty chart No. 591), to which we refer our readers. It will be necessary, however, to describe the light on East Brother island and that on the southern extremity of Mare island.

East Brother Island Light.—East Brother island lies off San Pablo point, on the eastern side of San Pablo strait. It has several shoals about it and should not be closely approached. It exhibits a light *flashing* every 80 seconds, at 68 feet above the sea, visible 18 miles. The lighthouse consists of a square wood building; and its position is lat. $37^{\circ} 57' 40''$, long. $122^{\circ} 25' 59''$. A fog-whistle, placed on the eastern end of the island, gives blasts of 8 and 4 seconds, with intervals of 24 seconds during foggy weather. From the lighthouse Penole point, San Pablo bay, bears N.E. by N. $\frac{1}{2}$ N., $4\frac{1}{2}$ miles; point San Pablo N.E. $\frac{1}{2}$ E. $\frac{1}{2}$ mile; wharf at San Quentin S.W. $2\frac{1}{4}$ miles.

Mare Island Light.—A *fixed white* light is exhibited from the extreme south-eastern end of Mare island, at the entrance from San Pablo bay to the strait of Karquines. The light is 76 feet above the sea and visible 14 miles. Position, lat. $38^{\circ} 4' 17''$, long. $122^{\circ} 15' 16''$. During foggy weather a bell is sounded.

The hills to the northward of the lighthouse rise to a height of about 800 feet above the water, forming a dark back-ground. The *red* buoy, No. 4, at the juncture of Mare and Karquines straits, is distant half a mile E. $\frac{1}{2}$ S. from the lighthouse.

Directions.—When approaching the coast every opportunity should be seized for determining the vessel's position, as fogs and thick weather prevail near the land. Vessels coming from *southward* make the coast about point Año Nuevo (lat. $37^{\circ} 7'$), and follow it at a distance of 4 or 5 miles up to the bar. Steamers keep close under the land for fear of losing it in foggy weather. Coming from *westward* they first sight the South Farallon island (lat. $37^{\circ} 42'$), and keep upon either side of it; but it is preferable to go southward of it, especially in thick weather and at night, as the vicinity of the island has not yet been minutely surveyed (1875.) From South Farallon lighthouse point Bonita light bears N.E. by E. distant $23\frac{1}{2}$ miles. Coming from *north-westward* vessels make point Reyes (597 feet high, in lat. $38^{\circ} 0'$, long. $128^{\circ} 0'$) and pass within 2 or 3 miles of it, 15 fathoms being found within a quarter of a mile from it, but they are apt to lose the wind by getting too close under it. From the western

extremity of this point Bonita Point light bears E. $\frac{1}{2}$ S., distant $25\frac{1}{2}$ miles, the line passing over the tail of Duxbury reef, at a distance of $17\frac{1}{2}$ miles from point Reyes.

Three fairway buoys (described on page 210) are moored on the prolongation of the range from Alcatraz island to Fort point, giving a course N.E. $\frac{3}{4}$ E. for vessels entering the Golden Gate, and designated by Belcher the "fair-way line." In clear weather and with a favourable wind a vessel can cross the bar in not less than $4\frac{1}{2}$ fathoms from the line, having the north end of Alcatraz island just open of point Bonita (N.E. by E. $\frac{1}{4}$ E.), round to the shore south of point Lobos (N. by W. $\frac{1}{4}$ W). Northward of the former line the 4-fathom bank (having $3\frac{1}{2}$ fathoms on it) commences one mile west of Bonita, and stretches out over 3 miles, with a breadth of one mile.

Between the eastern extremity of the "4-fathom bank" and the shore, the distance is $\frac{3}{4}$ of a mile, and within this space can be found the deepest water for entering the harbour, but it would be dangerous for a sailing vessel to attempt it with a flood tide and light winds. While it is breaking on the bank only a heavy swell is found through this $8\frac{1}{2}$ -fathom channel, and small sail-boats have passed in safety when they dared not try the bar. Close in under the cliffs, or 2 or 3 miles above Bonita, is anchorage in 8 fathoms, with muddy bottom.

During clear, moderate weather any vessel can cross the bar, within the limits we have mentioned, without running until she has got on the 'fair-way line,' whereby she might lose her slant of wind. Should the wind fail, or be light, and the current adverse, anchor outside the bar in 15 fathoms, mud and fine sand; or, after crossing the bar, in 6 to 10 fathoms, fine gray sand, with red specks in some places. Run in mid-channel between the heads; avoid too close proximity to the northern shore, not only in entering, but in leaving; the high, bold bluffs causing calms and baffling airs, even with a south-easter blowing out. Between Fort point and the opposite shore, take special care not to approach Fort point too close, because the currents set around it irregularly and with great rapidity, and the bottom is uneven and rocky.* A depth of 60 fathoms is in the centre of the channel. In the Golden Gate an ebb current has been measured running about 6 miles per hour. As a general rule, the winds increase within the heads, drawing in very strongly abreast of Fort point. When off this point steer for Alcatraz lighthouse until the north point of Telegraph hill bears E. by S., then steer to give it a berth of a quarter of a mile, running through among the shipping.

In making the port at night it is customary to run for the whistle buoy and cross the bar with Fort Point light on with Alcatraz Island light, or better, the latter a little open to the northward. But this practice frequently involves much delay and annoyance when the wind will not permit a vessel to attain this position without a tack. With Bonita light bearing from N. by W. to N.E. by E. a vessel may boldly run on within these limits, and, unless there be a heavy swell, safely cross the 4-fathom bank. Give Bonita a berth of a mile, and when within the heads, and Bonita abeam, gradually open Alcatraz light north of Fort point, until abeam of the latter; then run for Alcatraz until the lights of the shipping show the vessel's

* Dangerous rocks have recently been discovered in the vicinity of Fort point (see page 200).

position. Hauling up for them, anchor off the north beach in 10 fathoms, or off the north-east front of the city in 10 fathoms, soft mud.

In coming upon the coast in thick foggy weather, sailing vessels should not run into less than 50 fathoms because the water around the South Farallon, and off points San Pedro and Reyes, is very hold. It is believed, however, that a 30-fathom bank exists at a considerable distance westward of the latter. South-west of the line passing through the Farallones and Noonday rock, the 100-fathom curve is only 4 miles distant, and the 50-fathom curve only 2 miles, with a very irregular bottom. If the Farallones be made, a course can be easily laid for the bar, but it would be unadvisable to run into less than 10 fathoms, soft mud, if the whistle-buoy be not heard, as the set and strength of the currents off the bay are yet undetermined. Belcher says that, being caught in a fog, he anchored in 15 fathoms, to the southward of the bar, and determined "that southerly of the fair-way line the ebb tide set N.N.E., flood S.S.W." We suppose he means from the N.N.E., and from the S.S.W. During the season of freshets in the Sacramento and tributaries the discoloured water outside the bar will frequently point out the position of the entrance.

Steamers in thick weather used formerly to run close along the coast, and endeavoured to make the land north of point San Pedro, running in until they got about 15 fathoms, and then laying a course for the bar, shoaling upon it to about 5 fathoms, and then gradually deepening, while the fog-gun (now replaced by a siren-trumpet) gave the direction of Bonita light.

The U.S. sloop-of-war *Vincennes*, during the cruise of the Exploring Expedition, anchored on the bar in a calm, and, when the flood tide made, it brought up a swell that broke over her.

In beating out, the best time to start is on the last quarter of the flood. Having avoided the Blossom rock (on which the depth is 32½ feet) proceed westward through the channel between Alcatraz and the south shore, avoiding Fird rock, one mile west of the south end of the island, and giving a good berth to Fort point, past which the ebb current rushes rapidly (with a strong tendency towards the south shore); a couple more tacks will carry clear of the heads. If the vessel be bound northward, and the weather shut in thick, with the wind to the north-west, tack off shore southward of the Farallones; if the weather be clear make short tacks off shore until up to point Reyes, because the sea to the leeward of that headland is much smoother and the current less; then stand off until a course can be made for the port of destination.

Winds.—From April to October, inclusive, the prevailing wind is from the north-west, changing to west in valleys opening upon the coast, but in no case so strongly as through the Golden Gate. During the summer the wind sets in strong about 10h. A.M., increasing until nearly sunset, when it begins to die away. During its height it almost regularly brings in a dense fog, which, working its way over the peninsula, meets that already advanced through the Golden Gate, and envelopes San Francisco and the bay by sunset. As a rule, the breeze does not dispel the fog. If a fog exist outside, the wind is sure to bring it in, but the heated earth dissipates it for a time.

From November to March the wind is frequently from the south-east, blowing heavily, working round to the south-west, with a large and broken swell from the S.W.,

weather thick, rainy, and squally; the wind not unfrequently ending at N.W., with an ugly cross sea. During heavy south-easters the sea breaks upon the San Francisco bar, clean across the entrance, presenting a fearful sight. The sound can be heard at the anchorage in front of the city.

During some winters a hard "norther" will spring up and blow steadily and strongly from one to five days, with a clear blue sky, and cold bracing weather. Winds rarely blow from points between North, round by the east, to South-east.

The further north we advance, the heavier blow the gales in the winter. The north-west winds are not predicted by the barometer, but, those from the south-east, almost invariably; the mercury falling one inch from its usual height of 30 inches. When it begins to rise, the wind may generally be looked upon as soon to shift round by the west, and to decrease.

On the tops of the mountains bordering the coast, light variable and easterly airs are frequently experienced whilst the north-west winds are blowing freshly along the seaboard. Upon Sulphur peak, in latitude $38^{\circ} 46'$, and 26 miles from the coast, fresh breezes from the E.N.E. have been experienced whilst the usual north-west winds were prevailing off shore.

Tides.—The corrected establishment of the port at San Francisco, is 12h. 6m. The mean rise and fall of tides is 3.6 feet; of spring tides 4.8 feet; and of neap tides 2.8 feet.

THE COAST.—From point Bonita to Duxbury point, forming the west side of Ballenas bay, the course is W. by N. $\frac{1}{4}$ N., and the distance $9\frac{1}{4}$ miles. The point, sometimes called Ballenas, is a table land about 100 feet high, which stretches along the coast for a mile or more, and gradually rises to a narrow, nearly treeless ridge, 1889 feet high at its greatest elevation, and running in a straight line $25\frac{1}{4}$ miles N.W. $\frac{1}{4}$ W. to Tomales point. The old Californians expressively call it the Cuchilla Grande. Parallel to this ridge on the east, and starting from the west end of the great cross ridge of Table mountain, runs another to the north-westward, and the depression between them, abreast of Duxbury point, forms Ballenas bay, as it does also Tomales bay further up the coast. This depression forms a long narrow valley, well watered and timbered, and in many places cultivated. Two streams, running into each bay, have their sources nearer the bay from which each runs.

Duxbury reef makes out $1\frac{1}{4}$ miles S.E. $\frac{1}{4}$ S. from the southern extremity of the point, and stretching towards point Bonita, forms a safe anchorage in northerly weather. From the tail of the reef to the rocky point E.N.E. from it, the distance is 3 miles, and from this line to the greatest bend of the bay the distance is $1\frac{1}{4}$ miles. In this bay the 8-fathom line makes off three-quarters of a mile from the south-east face of Duxbury point, but approaches the low sand beach east of the narrow entrance to the lagoon. From 4 to 8 fathoms water, with a regular bottom of sand and mud, are found in the bay, and 6 fathoms quite close to the reef. From Duxbury point to the bluff at the entrance to the lagoon, the distance is $1\frac{1}{4}$ miles N.E. by N.

The lagoon north of the bay is at the foot of the mountains, and, except small crooked channels, is bare at low tides, and filled with small islets. The south side of this lagoon is bounded by a long, narrow sand spit, stretching so nearly across it as to

have an entrance of but 100 yards wide at the south-west part of it. Only a few small vessels run between this place and San Francisco.

The shore north of Bonita point is bold and high, presenting a marked and peculiar undulating surface at right angles to the sea front.

North of Duxbury point the hard rocky shore continues bold and high, but gradually merges into cliffs, consisting chiefly of yellowish clay and sand resting upon granite, and, as the surface is regularly undulating, with the direction of the alternate ridges and valleys at right angles to the shore, the wearing action of the surf forms a continuous series of round-topped, bright, vertical bluffs, averaging nearly 100 feet in height, and presenting a very noticeable feature from the sea.

The mountains in the back ground rise over 2000 feet, and the 'Table mountain' of Beechey, attaining an elevation of 2604 feet, stretches nearly 2 miles inland at right angles to the coast, and forms a prominent mark from seaward and from the bay of San Francisco. A few large trees are seen along the top of the main ridge running parallel with the coast and behind the valley, connecting Ballenas and Tomales bays.

Table mountain is a very sharp ridge, showing flat-topped only in two directions. From South Farallon lighthouse it bears N.E. $\frac{1}{4}$ N., distant 24 miles. The geographical position of the eastern peak is lat. $37^{\circ} 55' 30''$, long. $122^{\circ} 39' 38''$.

Drake Bay.—From the tail of Duxbury reef to the west end of point Reyes the course is W. $\frac{1}{4}$ N., and distance $17\frac{1}{2}$ miles. To the east end the course is W. by N., distance $14\frac{1}{2}$ miles. From Duxbury the shore is bold and compact, running nearly N.W. by W. for about 10 miles, then curving regularly to the westward, changing to a low shore, until it reaches its greatest latitude at the Estero de Limantour, which bears N. by E. $\frac{1}{4}$ E. from the east end of point Reyes, distant 3 miles; thence the line curves to the southward and south-west, one mile west of the point, leaving a long, high, narrow point stretching to the east, and off which the breakers extend half a mile. This curving shore-line forms Sir Francis Drake's bay, which affords a large and admirable anchorage in heavy north-west weather; and by anchoring close in under the north side of the point, in 4 or 5 fathoms, hard bottom, good but contracted anchorage is obtained in south-east gales, as the swell rolling in from the S.W. is broken by the reef.

Several esteros or lagoons open into the north side of the bay, but their entrances are very narrow and shoal. The largest is the Estero de Limantour, which stretches to the northward over 3 miles, and one of its numerous arms approaches within a mile of the ocean beach, 5 miles north of point Reyes head. The entrance to this lagoon has 8 feet of water, and is generally marked by breakers on either hand. Coasters can enter with the prevailing north-west wind.

POINT REYES.—This is the most prominent and remarkable headland north of point Concepcion. It is distinctly visible from the entrance to San Francisco bay, and the summit of the ridge presents an irregular rugged outline, with the highest part about one-fourth of its length from the western extremity. Its southern face is a precipitous wall of hard sienitic granite, rising boldly from the ocean, attaining an elevation of 597 feet in 300 yards, and stretching nearly in a straight line E. by N. and W. by S. for 3 miles. This direction is peculiar on the coast, and would not be

expected from a consideration of the trend of the coast mountains and of the Farallones, which are in line N.W. and S.E. On the north side the cape falls away regularly to a low undulating neck of land, cut up by esteros making in from Drake bay. When made from southward it is raised as a long, high island; but on approaching it from westward it is projected upon the mountains running north from Table mountain, and its characteristics are not so readily recognized. Its base is very broken and rocky, and bordered by crags and hundreds of rocks, but may be boldly approached, and 8 fathoms, hard bottom, obtained within less than a quarter of a mile. Off the eastern extremity a reef makes out half a mile in continuation of the point. Upon this reef the sea breaks heavily in bad southerly weather, but 9 fathoms can be had close to the breakers. Off the western head a depth of 12 fathoms is found quite near to the rocks.*

Point Reyes Light.—On the pitch of the western head of point Reyes is a lighthouse from which is exhibited a light *flashing at intervals of 5 seconds*; it is 296 feet above the sea and visible 24 miles. The lighthouse is constructed of iron and is sixteen-sided; its geographical position is lat. $37^{\circ} 59' 36''$, long. $128^{\circ} 1' 21''$. During fog a steam-whistle is sounded for 8 seconds at intervals of 52 seconds.

From point Reyes lighthouse point Bonita lighthouse bears E. $\frac{1}{4}$ S., distant $27\frac{1}{2}$ miles; South Farallon lighthouse S. by E. $\frac{1}{4}$ E., $17\frac{1}{2}$ miles; point Arena lighthouse, N.W. $\frac{1}{4}$ W., 67 miles.

Vessels bound to San Francisco from northward always make point Reyes, and, when up to it, sight two mountains on the southern peninsula of San Francisco as islands. One of these is Blue mountain, 1100 feet high, and the other, Abbey hill, 1250 feet.

THE FARALLONES.

SOUTH FARALLON.—The southern and principal one of the six rocky islets known as the Farallones de los Frayles, lies off the Golden Gate at a distance of $23\frac{1}{2}$ miles;

* A shoal had long been known to exist some miles westward of point Reyes, a cast of 30 fathoms having been made in that vicinity as early as 1853. When surveyed in 1873 "the least water found was 25 fathoms, about one mile S.E. $\frac{1}{4}$ E. from the central point of the shoal. Within the curve of 30 fathoms the shoal is 5 miles long, with an average width of $1\frac{1}{2}$ miles; but it is 12 miles long, and 5 miles wide within the 50-fathom curve. Its longest axis is in a direction N.W. and S.E., or nearly in the prolongation of a line through the Farallon islands." Sounding within the 30-fathom curve, the lead failed to bring up specimens of bottom, it proving to be rocky; the armed lead brought up live barnacles. Outside of this curve there is a deposit of white shells, broken fine. Beyond the depth of 40 fathoms, coarse black sand, mixed with gravel and broken shells, was found. The general set of the current appeared to be in a southerly direction, with a velocity of about one to $1\frac{1}{2}$ knots per hour. The water gradually deepens from the shoal toward the mainland, attaining a depth of 70 fathoms, after which it shoals again toward the shore. It is probable that depths of less than 25 fathoms may yet be found within the limits of this shoal, it will therefore receive further attention, because of its importance to vessels coming from the northward in thick weather. A change of swell is rapidly perceived upon the shoal.

the whole group is disposed in a nearly straight line running N.W. from the southern one. This is the largest and highest, extending nearly a mile east and west, attaining an elevation of about 340 feet above the sea, and presenting to the eye a mass of broken rugged rocks, upon which no vegetation exists, except a few stunted weeds. The rocks are sharp angular masses, which, becoming detached by the operations of natural causes, roll down upon the more level parts of the islet and cover it with irregular boulders. A more desolate and barren place can hardly be imagined. From the hills about the Golden Gate the South Farallon is plainly visible, rising in regular pyramidal form.

Vessels from westward, running for the Golden Gate, should keep southward of the South Farallon, especially in thick weather and at night. Westward of it a depth of 50 fathoms is obtained at a distance of 3 miles, shoaling to 20 fathoms in 2 miles; whereas, inside of it, the bottom is very regular at 30 fathoms for 10 miles, and then decreases regularly to the bar. On the south-east side of the island there is said to be good holding-ground in 15 fathoms. The San Francisco pilot-boats cruise off the island.

Light.—The lighthouse on South Farallon is in lat. $37^{\circ} 41' 49''$, long. $123^{\circ} 0' 4''$; it stands on the highest peak of the rock. The light *flashes* at intervals of *one minute*, is 360 feet above the sea, and visible 26 miles over the entire horizon. From it the North Farallon bears N.W. by W. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles; western head of point Reyes, N. by W. $\frac{1}{4}$ W., $17\frac{1}{2}$ miles; point Bonita lighthouse, N.E. by E., $23\frac{1}{2}$ miles; and point San Pedro, East, $23\frac{1}{2}$ miles.

About half a mile S.E. $\frac{1}{4}$ E. from South Farallon lighthouse is a sunken rock having $6\frac{1}{2}$ fathoms water on it, and 18 to 15 fathoms between it and the island; the sea breaks on it only in heavy weather. The pilots report having observed breakers between the South and Middle Farallones; this rock is supposed to have only 8 or 4 fathoms water over it.

MIDDLE FARALLON.—This is a single rock, between 50 and 60 yards in diameter, and rising 20 or 30 feet above the water. It lies N.W. by W., distant $2\frac{1}{2}$ miles from the lighthouse on the South Farallon. Its geographical position is lat. $37^{\circ} 48' 32''$, long. $123^{\circ} 1' 55''$.

A sunken rock, with $5\frac{1}{2}$ fathoms water on it, and 8 to 10 fathoms close around it, lies about half a mile S.S.W. $\frac{1}{4}$ W. from the Middle Farallon and $2\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from the South Farallon lighthouse. With a high sea running breakers have been observed upon it. The depth between the rock and the Middle Farallon is 18 fathoms, and between it and the South Farallon 15 to 20 fathoms.

NORTH FARALLONES.—These lie nearly in line with each other and the Middle and South Farallones, and consist of a group of four islets, having a pyramidal appearance as their name denotes, and comprised within a space of little more than half a mile square. The northern three are quite high and bold, the highest peak of the middle one attaining an elevation of 166 feet, whilst the southern one of the group is a mere rock of about 85 yards in diameter, and hardly 20 feet above water. Viewed from south-west or north-east, breakers extend across from the largest islet to the next one south-east, and during a heavy ground swell, an observer on Reyes hill has watched the sea breaking on an isolated sunken rock lying apparently between the northern and largest islet. From certain directions a small pyramidal detached peak shows close to the north side of the northern islet.

The northern islet is in lat. $37^{\circ} 46' 11''$, long. $128^{\circ} 6' 25''$, and has an extent of 160 yards.

It is said that a rock of 4 fathoms, upon which the sea breaks in bad weather, lies 2 miles south-eastward from the North Farallones, and that it has kelp around it, except when torn away by storms. In good weather the fishermen are reported to fish around it.

Noonday Rock.—This danger lies nearly on the prolongation of the line from the South Farallon, through the North Farallones, and is distant about 8 miles W. by N. from the latter. It is of very limited extent, and has 20 to 30 fathoms immediately around it. When examined in 1874 it was discovered that the rock terminated in three pinnacles, and that one of the peaks had only 14 feet water over it at mean low water. In very heavy weather and low water the sea breaks upon it, but this indication seldom exists, and must not be depended upon for ascertaining its position. From it point Reyes (western head) bears N. by E. $\frac{1}{2}$ E., distant $18\frac{1}{2}$ miles; North Farallon, E. by S., distant $8\frac{1}{2}$ miles; South Farallon lighthouse, E. by S. $\frac{1}{2}$ S., distant $9\frac{1}{2}$ miles; and point Bonita lighthouse, E. by N. $\frac{1}{2}$ N., distant $80\frac{1}{2}$ miles*.

In the description of the South Farallon, and in the directions for approaching San Francisco, we have heretofore advised vessels approaching the Golden Gate at night and in thick weather to keep southward of the South Farallon light. This advice has now more significance, and should be followed. With point Reyes and the Farallones in sight, vessels bound in and running between them should keep the western head of point Reyes open on a N.N.E. course, coming nothing to the eastward, until the North and South Farallones are in range, then bear away for the Golden Gate. In that position the rock will bear S.E., distant $2\frac{1}{2}$ miles. Coming from north-westward at night, vessels should not bring the South Farallon light to bear anything east of S.E. by E., which will clear the rock by 2 miles, and the North Farallones by one mile.

South-west of the line passing through the Farallones and Noonday rock, the 100-fathom curve is only 4 miles distant, and the 50-fathom curve only 2 miles, with very irregular bottom,†

POINT REYES TO CAPE CLASSET.

Magnetic Variation in 1880:—Off Point Reyes $16\frac{1}{2}^{\circ}$ E.; Point Arena $17\frac{1}{2}^{\circ}$ E.; Cape Mendocino 18° E.; Crescent City $18\frac{1}{2}^{\circ}$ E.; Cape Orford $19\frac{1}{2}^{\circ}$ E.; Cape Foulweather $20\frac{1}{2}^{\circ}$ E.; Columbia River entrance $21\frac{1}{2}^{\circ}$ E.; and Cape Classet (or Flattery) $22\frac{1}{2}^{\circ}$ E. The annual increase is estimated to be 2 minutes.

THE COAST.—Northward of point Reyes is a long reach of broad white sand beach, backed by sand dunes, and extending in a N. $\frac{1}{2}$ E direction about 12 miles, curving

* It is intended to reduce the dangerous character of Noonday rock by blasting. One of the pinnacles has already been removed; and its former site, over which there are now 34 feet water, is indicated by a large buoy. (1879).

† In 1863 a shoal with 5 to 7 fathoms water on it, was reported to lie about 80 miles S.S.W. from the South Farallon. Its approximate geographical position from the above data is lat. $36^{\circ} 42'$, long. $124^{\circ} 10'$. Its existence is considered very doubtful.

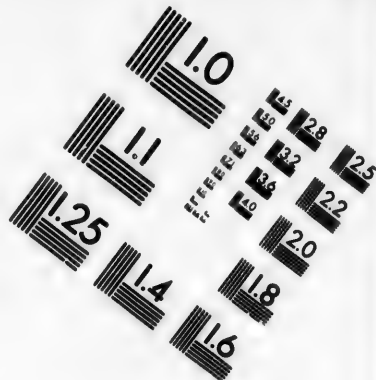
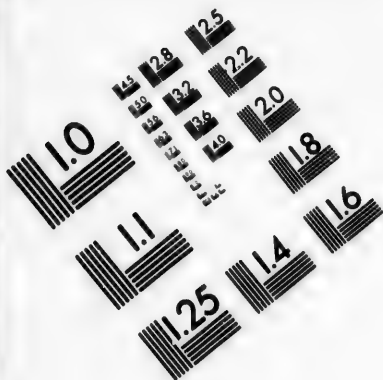
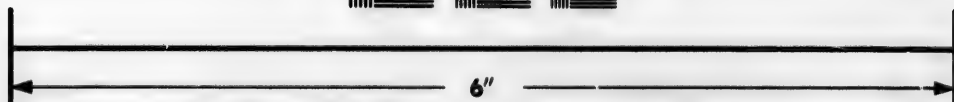
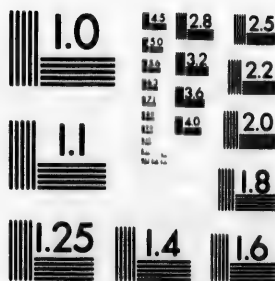


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to the north-west, and changing to a high precipitous coast running to point Tomales, which bears N. by W. 15 miles from point Reyes. Three-quarters of a mile before reaching the point, a rocky islet, 80 feet in height, is seen close in shore. Eight miles above point Reyes is the opening to an estero, the north point of which is low and sandy; the wider arm runs one mile towards the head of the western branch of the Estero de Limantour, a little more than that distance from it; the other arm runs nearly $1\frac{1}{2}$ miles to the north-westward. The ridge forming Tomales point and the western shore of Tomales bay is the northern extremity of that starting from Duxbury point. About $4\frac{1}{2}$ miles from the point the ridge is 678 feet high, with slightly lower ground a few miles south. It is where the sand dunes strike this ridge that the coast changes its character; thence to the point it is bold and rocky, with breakers about a third of a mile off the point, and on the prolongation of the ridge, which averages less than three-quarters of a mile in breadth for the last 4 miles.

The bay of Tomales extends from Tomales point S.E. $\frac{1}{2}$ E. for $12\frac{1}{2}$ miles, with an average width of nearly a mile. The entrance is narrow, and obstructed by a bar having a depth of 10 feet, between sandy lumps of 7 feet. The bar lies nearly half a mile east of the extreme point, and 2 cables from the bluffs. It is exposed to the full force of the north-west swell, and with the least swell from seaward it breaks across the whole entrance. For 2 or 3 miles this bay is contracted, but has a narrow deep channel close under the western shore. Four miles within the point lies a small island near the middle of the bay; beyond it the depth of water becomes more regular. Its shores are becoming thickly settled, and trade in agricultural products has increased so much that a small steamer has been put upon the route to San Francisco.

Bodega Head.—This point lies N.N.W. 18 miles from point Reyes, and forms the northern point of Bodega bay, Tomales point being the southern. The head is 200 or 300 feet high, with a slightly rounding summit, and continues of nearly the same height for a mile or two northward, where it changes to a broad sand beach with low country near, but high hills in the back ground. The face of the land about here begins to change from its uniform want of trees to hills partially covered. The highest part of the head is about 265 feet above the sea. The position of the head (one mile from its south extremity) is lat. $38^{\circ} 18' 20''$, long. $123^{\circ} 2' 47''$.

BODEGA BAY.—From Tomales point to Bodega head the course is N.W. $\frac{1}{2}$ W., and the distance $4\frac{1}{2}$ miles. The average width of the bay eastward of the above line is $1\frac{1}{2}$ miles, with the shore running nearly a parallel course. It is bordered by numerous rocks, is abrupt, and reaches a height of 594 feet less than a mile inland. The anchorage lies between the head and the mouth of the Estero Americano (called Avatcha by the Russians), which lies E. by N. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles from the head. One mile west of the Estero a low narrow sand-spit, $1\frac{1}{2}$ miles long and covered with bushes, stretches towards the head, within 100 yards of it, where a passage exists for the waters of the extensive lagoon north of the sand-spit, having small and intricate channels, but almost destitute of water at low tides. The anchorage is half a mile outside of this passage, and about N. $\frac{1}{2}$ E. of the rocky islet, in 5 or 6 fathoms, hard bottom of coarse sand and small patches of clay. It is protected by the head and the low rocky islet and reef, about three-quarters of a mile off the south-east face, from the full force of

the north-west swell, which generally rolls in disagreeably in the open part of the bay if the weather is heavy. The reef is densely covered with kelp, and the breakers usually indicate its position. Between the islet and the head there is a narrow 4½-fathom passage opening directly upon the anchorage. In coming from the north-west in summer this channel is available; but in beating out it is too contracted to be safe. During the winter season it is necessary to anchor well out, to be ready to slip and run, as the sea-room is very contracted and swell heavy. Some vessels have ridden out heavy south-easters, but several have been lost. In beating out, the only danger is the reef off the head.

On account of the general depression of the coast-hills behind Bodega bay, to about 500 or 600 feet elevation, and the valley in which the Estero Americano lies being perpendicular to the coast line, the summer winds draw in towards the Petaluma valley with great force. The trunks of the oak trees rise straight for about 10 feet, then bend almost at right angles, without a branch for 10 or 15 feet, and terminate in a clump of branches all dragged out by the force of the wind. Fogs are found drawing in sooner and more frequently than upon any other part of the coast.

The country in the vicinity of the bay is very productive, both in the valleys and upon the hills. The produce is placed in lighters at the "port" or embarcadero, about one mile within the lagoon, and carried by the current to the anchorage.

Tides.—The corrected establishment at the port is 11h. 17m. The mean rise and fall of tides is 8·6 feet; of spring tides, 4·7 feet; and of neap tides, 2·7 feet.

Fort Ross.—At about 15 miles from Bodega head, and 82 miles N.W. ¼ N. from point Reyes is Fort Ross, off which vessels occasionally anchor, but it is by no means a desirable place to ride in as the anchorage is rocky, contracted, and consequently unsafe. The large white buildings of the Russians on the rising ground, and about 100 feet above the sea, are the only marks for making it, and the shore is so steep and skirted by rocks and reefs as to render approach dangerous. No trade is now carried on here. Its geographical position is lat. 38° 30', long. 123° 18'.

The shore between Bodega head and Fort Ross curves slightly to the eastward of the line joining the two places. Sand-dunes commence 1½ miles from the southern point of the head, and extend 2½ miles to the mouth of a small stream called Salmon creek; these dunes are bordered by a broad sand-beach. At 9½ miles from Bodega head the Slavianska (known as Russian river) empties into the sea, breaking through the coast-hills that here reach an elevation of 2200 feet. During the summer months a dry bar forms completely across the mouth of the river, so that the trail along the coast passes over it. It requires heavy rains to break through it, and forms again after a few weeks of dry weather. During the summer the bed is dry above Healdsburg, 80 miles from the mouth, and can be forded in several places in that distance. Before breaking through the coast-hills it comes from the northward through a broad fertile valley. The arroyos and streams opening into the Russian river near the coast are filled with a very dense growth of heavy redwood; and in 1860 a tram road was being constructed along the coast to the lagoon inside of Bodega head to carry the lumber from the mill on the river.

From Ross mountain, 2198 feet in height, the discoloured water of the river has

been frequently observed to work along close in-shore to the northward, but never to the southward. The fishermen experience the same eddy current.

Northward of the Slavianska again commence the high coast-hills, covered with timber, which gradually approach the coast, and reach it about half way to Fort Ross. The Russian vessels used this as a distinctive mark for making the anchorage. Where the timber commences to skirt the coast a bold spur of the mountains comes directly upon the sea. At Fort Ross there is a small extent of open, cultivated ground, moderately low, but backed by the high wooded country. The coast and coast-hills to the northward are mostly covered with dense forests of immense redwood, pine, and a thick undergrowth.

Two miles above Fort Ross is a small contracted anchorage, called Timber cove, where a great deal of lumber is sawn, and carried by coasters to San Francisco.

Eight miles above Fort Ross is another contracted anchorage, under Salt point, where coasters load lumber.

From Fort Ross to point Arena the coast is almost straight, running N.W. by W. $\frac{1}{2}$ W., for 87 miles. It is compact and bold the whole distance, covered with trees to the water's edge, and backed by an unbroken ridge of hills about 2000 feet high, and wooded to their summits.

Haven Anchorage.—About 24 miles north-westward along the coast from Fort Ross and in lat. $38^{\circ} 47' 58''$, long. $123^{\circ} 34' 1''$, is a confined anchorage under high precipitous rocky islets, with a short stretch of beach on the main, affording a boat landing. There is protection, when anchored close in, against heavy north-west weather; but it would be very difficult to recognize the locality unless the position of a vessel approaching it were accurately determined.

Northward of this anchorage high bold rocks line the coast for 4 or 5 miles. They are generally known as "Fishing rocks."

A few miles south of this anchorage is the mouth of the Walalla river, open in the rainy season, but having a dry bar in summer. It rises south of Fort Ross, behind the first range of coast-hills. One of the Coast Survey stations, on the north side of river, and 8 or 4 miles from the coast, has an elevation of 2192 feet, and this may be taken as the general height of this coast range.

Point Arena and Light.—This is the first prominent headland north of point Reyes, from which it bears N.W. $\frac{1}{2}$ W., distant 67 miles. Approached either from northward or southward it presents a long level plateau, stretching out about 2 miles west of the highlands, and terminating in a perpendicular bluff that averages about 200 feet in height, except the extreme north-west part, which is comparatively low, partially covered with sand, and destitute of trees for some distance inland. When seen from southward, with the sun shining upon the face of the bluff, it shows remarkably white for the length of 2 miles. Deep water is found close off the point, outside the kelp, which, stretching along to the southward, shows the set and comparative strength of the current which runs southward along the coast at the rate of 1 to 2 miles per hour.*

* Point Arena and the coast southward of it are thus described by Vancouver, "Point Arena is a conspicuous mark on the coast, the shores to the north of it taking a N. 10° W. direction. Its

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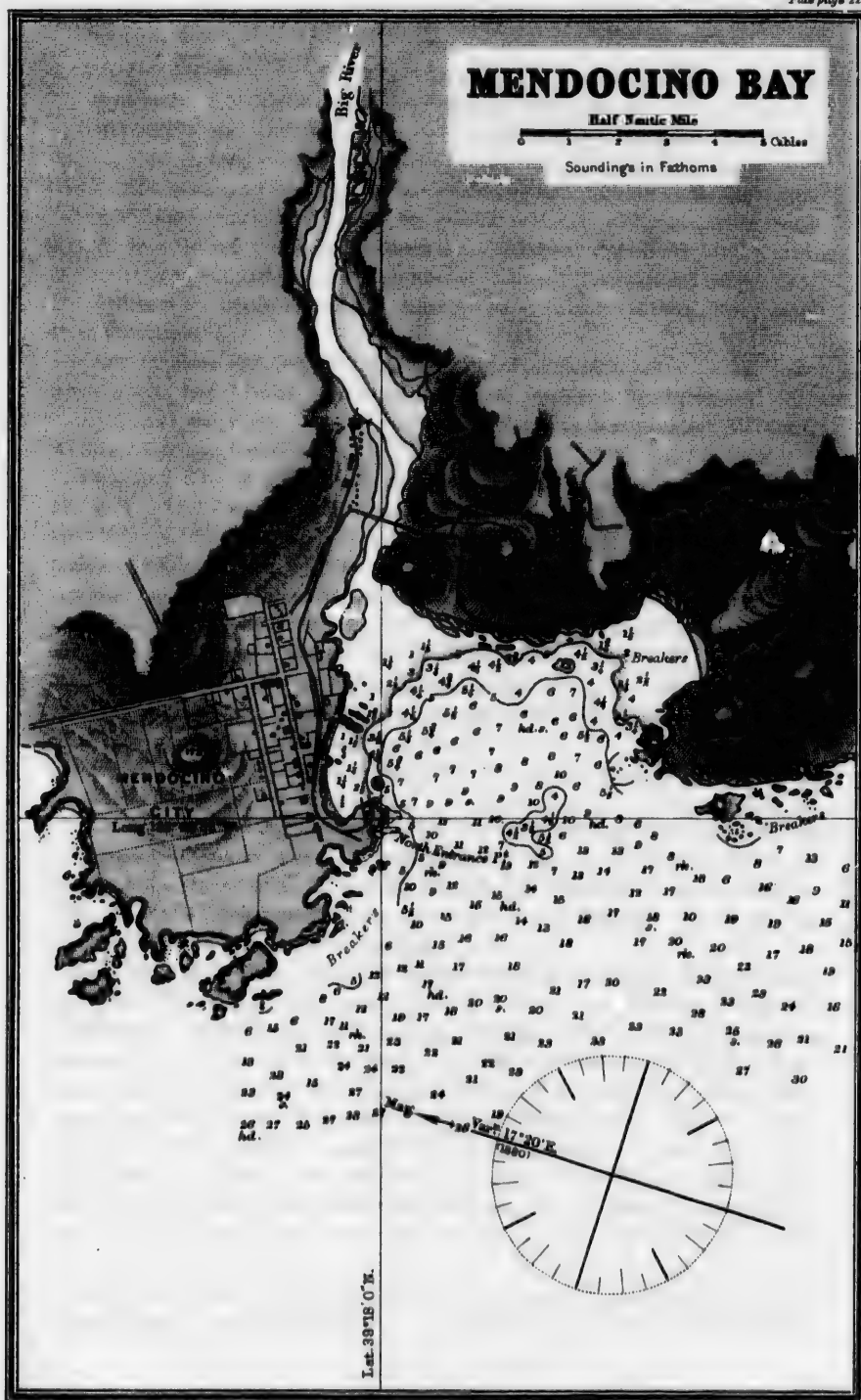
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At about 100 yards from the north-west extremity of point Arena is a conical brick tower, painted white, from which is exhibited a *fixed white* light, at 156 feet above the sea, visible 19 miles. At 868 feet west of the tower is a low frame building containing a steam-whistle, which during fog gives a blast of 5 seconds duration at intervals of 25 seconds. The geographical position of the lighthouse is lat. $38^{\circ} 57' 10''$, long. $123^{\circ} 44' 42''$.

At about 2 miles southward of point Arena a small contracted valley opens upon the shore, and off it is an anchorage for small vessels, moderately well protected from the north-west swell, but open to the south-west. Several schooners have gone ashore here. A large bed of kelp lies off the anchorage.

At about $1\frac{1}{4}$ miles N. by W. from point Arena are several rocks showing just above water, and upon which the least swell breaks. These were noticed by Vancouver in October 1793. A high sharp pinnacle rock lies off the shore to the southward of point Arena with some rocky islets inside, and breakers well out beyond the pinnacle rock, yet northward of it; these rocks are visible from off point Arena and appear to be less than a mile from shore.

At about 10 miles northward of point Arena is a small stream named Navarro, upon which is a lumber mill. Articles floating from this river are occasionally found on the coast northward of it.

Albion River.—From point Arena the first point to the north-westward is 24 miles distant, on the bearing of N.W. by N. $\frac{1}{4}$ N. After passing point Arena the coast trends eastward of North, and for 6 miles presents a low shore line with sand beach, changing suddenly to a straight high bluff shore with a few trees, and backed within half a mile by hills 2000 feet high, covered to their summits with wood. At $16\frac{1}{4}$ miles from point Arena is the mouth of the Albion river, a very small stream, with the barest apology for a harbour at its mouth. A saw-mill upon this stream induces coasters to obtain freights here, but a great many of those trading have been lost. In 1858 the Coast Surveying steamer *Active* passed in, but broke her anchor on the rocky bottom.

Mendocino Bay.—At $20\frac{1}{4}$ miles from point Arena, and 4 miles northward of Albion river, is an inlet named Mendocino bay, which is available for a few vessels in summer, but dangerous in winter. The northern and southern points are about three-quarters of a mile apart, and the eastern shore retreats nearly half a mile. At the southern head are several small rocks, and one large islet surrounded by rocks, off which are heavy breakers. Midway between the heads is a small reef upon which the sea breaks heavily with very little swell; deep water is found close around this reef. Off the

northern side is composed of black rugged rocks, on which the sea breaks with great violence; to the south of it the coast trends S. 85° E. Its southern side is composed of low sandy or clayey cliffs, remarkably white, though interspersed with streaks of a dull green colour. The country above it rises with a gentle ascent, and is chequered with copses of forest trees and clear ground, which gives it the appearance of being in a high state of cultivation. The land, farther south, is high, steep to the sea, and presents a rude and barren aspect. As we approached the shore advancing to the southward, the country became nearly destitute of wood and verdure, at least that part of it in the vicinity of the sea shore, which was nearly straight and compact. The more interior hills, rising behind those forming the coast, were tolerably well wooded."

northern head are numerous rocks and islets, outside which are breakers. Into the north-east part of the bay enters the Big river or Rio Grande, between 200 and 800 yards wide, having a bar at the mouth with but a few feet of water, and upon which the sea always breaks. The eastern shore of the bay is bold and rocky; in the south-eastern part is a sand-beach, with a reef extending from its centre.

The bay forms so slight an indentation in the coast-line that it is difficult to find without acquaintance with its minute peculiarities, as there are no prominent marks by which to determine it. The north head, upon which is situated the town of Mendocino City, is a table bluff about 60 feet high, and destitute of trees to the northward and some distance inshore. The south bluff is likewise destitute of trees, but more irregular in outline than the other. Vessels bound for this place in summer work a little to windward; then run boldly in towards the North Entrance point, after rounding which they anchor in 5 or 6 fathoms, hard bottom, about a cable eastward of the point. It is a bad berth in summer, and in winter a vessel must anchor far enough out to be able to slip her cable and go to sea upon the first appearance of a south-easter. Several vessels have been driven ashore here. In passing the North Entrance point give it a berth of at least a cable, as reefs extend off it in a southerly direction.

An extensive saw-mill is, or was, situated on the north side of Big river, about three-quarters of a mile up.

The geographical position of the North Entrance point, Mendocino bay, is lat. $39^{\circ} 18'$, long. $123^{\circ} 48' 32''$.

From the point just north of Mendocino bay—the first one made from point Arena—the shore runs nearly straight for 28 miles in a N. by W. $\frac{1}{4}$ W. direction, being low and bounded by rocks for 12 miles, when the hills reach the water and present an almost vertical front 2000 feet in height.

At about 16 miles northward of Mendocino bay is the entrance to Ten-Mile river, in about lat. $39^{\circ} 38'$. This, like most of the rivers on this part of the coast, closes up for a period near the end of the dry season, the sand then forming a bar at the entrance.

From the deepest part of the bight (a short distance northward of Ten-Mile river) the general trend of the coast to cape Mendocino is N.W. $\frac{1}{4}$ W., and distance 45 miles; and for the whole of this distance it is particularly bold and forbidding, the range of hills running parallel to the shore and rising directly from it. It has been found impossible to travel along this stretch of seaboard; and the trail turns well into the interior valleys.

Shelter Cove.—Just to the northward of lat. 40° a bluff, 60 to 800 feet high, destitute of wood, juts out about half a mile from the coast line, and affords on its south side an anchorage from north-west winds. This cove may, perhaps, be regarded as a harbour of refuge for small coasters which have experienced heavy weather off cape Mendocino, and are short of wood and water, both of which may be obtained here from one or two gulches opening upon the sea. From point Arena Shelter cove bears N.W. by N. $\frac{1}{4}$ N., distant 65 miles.

The whole sea-face of the bluff, just mentioned, is bounded by thousands of rocks above and below water, and vessels coming from northward for shelter must give it a

wide berth, rounding it within a third of a mile. The anchorage is in 5 fathoms, hard bottom, at about a third of a mile from shore; in this position fresh water comes down a ravine bearing about North, and an Indian village existed in 1858 at the bottom of the wooded ravine, a little farther to the eastward. There is always a swell here, and boat landing may not be very easy.

The south-east part of the bluff (place of observation at about 60 feet above the sea) is in lat. $40^{\circ} 1' 14''$, long. $124^{\circ} 8' 8''$.

Sunken rocks extend nearly a mile off the coast, from Shelter cove to cape Mendocino, hence vessels should not approach it too closely.

Point Gorda.—From Shelter cove the coast trends 17 miles in a N.W. by W. $\frac{1}{4}$ W. direction to point Gorda, which, as its name implies, is a bold rounding point. At half a mile from it there is a rocky islet, and rocks also lie close inshore, north of the point. From point Arena point Gorda bears N.W. $\frac{1}{4}$ N., distant 81 miles.

CAPE MENDOCINO.—From point Gorda to cape Mendocino the distance is $12\frac{1}{2}$ miles in a N.N.W. $\frac{1}{4}$ W. direction, hence the cape is 98 miles N.W. $\frac{1}{4}$ N. from point Arena. Here the range of coast hills from southward appears to meet a range coming from eastward, the junction resulting in a mountainous headland of about 8000 feet in height. The cape is the western limit of the north-west trend of this section of the coast, and its geographical position is lat. $40^{\circ} 25'$, long. $124^{\circ} 22'$.

At about 8 miles off the cape is a group of sunken rocks, just under water, known as Blunt reef, upon which the sea generally breaks. Between Blunt reef and the cape are numerous sunken rocks and the passage is in consequence considered exceedingly dangerous to navigation.*

* The positions of the dangers off cape Mendocino have recently (1873) been accurately determined, and the depth of water upon most of them ascertained. They break only at low water, with a very large swell on.

The bearings and distances of these dangers from the Lighthouse are as follows:—

1. The "Great Break," a rock, having 25 feet water upon it, bears S. 68° W. 3 miles distant; from the south rock of Blunt reef it bears S. 6° E., distant three-quarters of a mile. It seldom breaks, and has 15 to 20 fathoms around it.
2. A rock, having 11 feet water upon it, S. 72° W., $2\frac{1}{2}$ miles distant; from the south rock of Blunt reef it bears S. 80° E., distant half a mile.
3. Heavy ground-breaks over an area of a quarter of a mile, in 9 and 10 fathoms, S. 77° W., 2 miles distant.
4. A rock having a sharp well-defined breaker, S. 52° W., $1\frac{1}{2}$ miles distant; it has 15 fathoms water, alongside it.
5. A rock, having 7 feet upon it, S. 26° W., one mile distant; it has 12 fathoms outside it.
6. A ledge, several hundred yards in extent, having 12 feet upon it, S. 7° W., distant $1\frac{1}{2}$ miles; it has 12 fathoms outside it.
7. A rock, having 13 feet of water upon it, S. 75° W., distant $1\frac{1}{2}$ miles; it has 13 fathoms around.
8. A rock, N. 82° W., distant one mile; it gives a sharp and well defined breaker; another rock lies about a quarter of a mile north-east of this. The first has 11 fathoms alongside it.
9. A rock, having 23 feet upon it, N. 66° W., distant $1\frac{1}{2}$ miles; it has 9 fathoms around it. To the southward of this rock are three heavy ground-breaks in 8 $\frac{1}{2}$ to 10 fathoms water.
10. A rock, having 12 feet water upon it, W. $\frac{1}{4}$ S., distant 6 cables from the Cape rock, lying off cape Fortunas; it has 13 fathoms around it.

In 1875 another sunken rock was discovered between the cape and Blunt reef. This rock is about one yard in diameter and has 6 feet on it at low water; it lies S.W. $\frac{1}{4}$ W. distant 7 cables from the lighthouse.

Note.—The dangers lying off cape Mendocino are characteristic of several points on the coast, and until thorough surveys are made, vessels should not attempt a passage inside of outlying rocks, and should also give them a good berth in passing outside.

Southward of, and immediately off the pitch of cape Mendocino, are numerous rocks and rocky islets, the latter being large and high, with a peculiar pyramidal or sugar-loaf appearance. None of them seem to be more than half a mile from the shore, which is almost perpendicular and destitute of a beach.*

The face of the cape is very steep, rocky, and worn. In its vicinity the general appearance is undulating, and the surface covered with timber. The pyramidal islets off it are very readily distinguished in approaching from northward or southward.

Light.—An iron tower, in shape a polygon of 16 sides and painted white, stands on the western slope of cape Mendocino. It exhibits a *white revolving light*; duration of flash 15 seconds, of eclipse 15 seconds. It is 428 feet above the sea, and visible about 2½ miles. Its geographical position is lat. 40° 26' 21", long. 124° 24' 14"; from it cape Blanco bears N. by W. ¼ W. 145 miles; Crescent City lighthouse N. by W. ¼ W. 79½ miles; Trinidad head N. ¼ W. 39 miles; point Arena S.E. ¼ S. 93 miles; and point Reyes S.E. ¼ S. 160 miles.

Blunt reef lies W. ¼ S. distant about 8 miles from cape Mendocino lighthouse.

At about 7 miles south of cape Mendocino is a small stream named Mattole. Upon the sides of the hills in lower Mattole, and not above a mile from the Pacific, coal oil springs were discovered in 1861. Along the course of this stream are numerous bottom lands under cultivation.

Cape Fortuno (False Mendocino) lies northward of cape Mendocino, distant 5 or 6 miles, and is another bold spur of mountainous headland, similar and almost as high as that cape. Between the two the shore recedes slightly, is depressed, and forms a beach receiving a small stream known as Bear or McDonald creek, which descends through a narrow valley. Bear river, like most of the rivers on this coast, becomes closed by a bar near the end of the dry season. Off cape Fortuno are several rocky islets presenting the same peculiarities as those off cape Mendocino, and a rock, with 12 feet water over it, lies 6 cables W. ¼ S. from the Cape rock. There is no beach at the base of the almost perpendicular sea face.

Soundings have been reported well to westward of the cape; should such prove correct, the fact will be of importance to vessels, especially to steamers, bound north or south, when near the coast and enveloped in fog, as it would enable them to judge of their position and change their course.†

Eel River.—Northward of cape Fortuno, the shore changes to a straight low sandy beach, with valleys running some distance inland. At 14 miles from cape Mendocino is Eel or Wee-et river, a small barred stream; it is very contracted and crooked, receiving the waters of a great many sloughs near its mouth, and draining a most fertile valley, which is rapidly filling up with settlers.

An extensive business in salmon fisheries is carried on near the mouth of Eel river.

* The isolated rock lying just off the pitch of the cape, and known as the Sugar Loaf or Haystack, is 328 feet above the sea, and bears W. by S. ¼ S. distant a third of a mile from the light.

† Lieut. Knox, U.S. Navy, is reported to have discovered a reef at about 8 miles N.W. by W. from the rocks off cape Mendocino. We suspect that this is Blunt reef, the distance being probably over estimated.

The first vessel known to have entered it was a schooner, in the spring of 1850, when searching for Humboldt bay. The bar had at that time a depth of 9 feet upon it at high tide. It rises by two sources in about latitude $39^{\circ} 30'$, about 30 miles from the coast, and runs nearly parallel with it.

HUMBOLDT BAY.—The entrance to this bay lies 21 miles from the lighthouse on cape Mendocino. The bar is $1\frac{1}{4}$ miles from the entrance between the sand points, or 2 miles from the south-west and highest point of Red bluff, which is the second bluff above Eel river. As with all the rivers on this coast, the bar undergoes irregular changes, depending much upon the prevalence, direction, and strength of the wind, hence it is not prudent to attempt to enter the bay without the assistance of a pilot, or the help of a tug.

A *bell-boat* is moored in 16 fathoms water off the bar; from it Humboldt lighthouse bears E. $\frac{1}{4}$ N. distant 2 miles, and Red bluff S.E. by E. $\frac{1}{4}$ E. (1872).

About 1852 a steam-tug was stationed in the bay, and has since rendered the most efficient service in determining the changes of the bar. When vessels are seen approaching the bar a flag is hoisted on Red bluff, and the tug goes out to take them in. If it is breaking so heavily on the bar that the tug cannot get through it, and it is yet practicable for the vessel to run in, she takes up a position and hoists her flag as a signal for the vessel to steer for her.

Light.—A lighthouse is established on the north spit of the bay, at three-quarters of a mile north of the entrance, and about midway between the bay and sea shores. It shows a *fixed* light at 58 feet above the sea, visible 12 miles. Its geographical position is lat. $40^{\circ} 46' 4''$, long. $124^{\circ} 18' 6''$.* During foggy weather a whistle gives alternate blasts of 4 and 8 seconds duration, at intervals of 24 seconds.

Tides.—The corrected establishment at the port is 12h. 11m. The mean rise and fall of tides is 4.4 feet; of spring tides, 5.5 feet; and of neap tides, 3.5 feet.

Humboldt bay, also known as Qual-a-waloo, is situated immediately behind the low sand spits and dunes, and extends 9 miles north and 4 miles south of the entrance; being contracted to less than half a mile in width between the south spit and Red bluff, it then expands to nearly 8 miles, and runs $1\frac{1}{4}$ miles to the eastward of Table bluff. The single channel running into this part of the bay divides into two crooked ones, which contain from 1 to 3 fathoms of water; all the rest shows a bare mud flat at low tides. Abreast the entrance it is nearly a mile in width, with extensive sands, bare at low tides, lying midway between the opposite shores, and running nearly parallel with them. To the northward its average width is half a mile for a distance of $8\frac{1}{2}$ miles; it then expands into a large shallow sheet of water, having two or three crooked channels through it, but the greater part is bare at low tides, showing extensive mud flats, bordered by a grassy flat nearly a mile in width. In the channel way close to the

* A light on Red bluff, which is nearly 100 feet high, would always serve as a leading range, as the flag-staff and ensign placed there are now thus used by the pilots. It would be distinguishable readily at sea, when the present one might be obscured by the mist hanging over the surf on the beach. During the day the white buildings would be a capital mark against the green hills and trees in the background.

north spit, not less than 8 fathoms may be carried, increasing for 3 miles to $6\frac{1}{2}$ fathoms. One mile north of the entrance, and on the eastern side, enters a small stream called Elk river. Two miles north of the entrance, and on the east side, is the town of Bucksport, off which a depth of $8\frac{1}{2}$ fathoms is found within 150 yards of the shore. Vessels are got alongside the saw-mill wharf here at high tide to load, at low tides they rest upon the muddy bottom. The military station of fort Humboldt is on a bluff about 100 feet high, immediately behind the town; the latter is on the south side of Red bluff. On the same side, and 4 miles north of the entrance, is the town of Eureka. Vessels lie at the wharves, resting on the mud at low tide. Abreast Eureka lie several low marshy islands cut up by sloughs and ponds. Arcata, formerly Union-town, is situated on the north-east shore of the bay, and can only be reached by boats at high tide. It is the starting point for the Trinity and Klamath mines. From it an extensive wharf stretches far out over the mud flat, which vessels can reach at high tides.

The southern spit from the entrance to Table bluff does not average a quarter of a mile in width; it is formed of low sand dunes and grassy hillocks, and bordered on the bay side by marsh. At the southern extremity rises Table bluff, which the name well describes, to a height of about 200 feet, its western point nearly reaching the sea beach, and forming a good landmark for making the bay. Five miles east of it the hills commence rising. Abreast the north end of the south spit rises Red bluff, presenting to the entrance a perpendicular face, composed of sand and gravel; it has a reddish colour near its surface, is 90 feet above high water, and destitute of tree or bush. On this bluff the pilots have a flag-staff to range with known points of trees beyond, by which they cross the bar and keep the run of its changes.

The north spit averages half a mile in width, and its southern extremity is composed of sand dunes and grassy hillocks disposed in a marked manner parallel with the direction of the north-west winds. Two miles from the entrance trees cover the hillocks and run northward one mile, when a space of a mile occurs without them; after that they continue along the shore.

In 1854 the town or village of Humboldt consisted of eight or ten houses, but in 1860 it had only two houses. At Bucksport there are several houses and one saw-mill. Eureka has eight saw-mills and a grist-mill, and presents a thriving appearance. Arcata has one saw-mill. (1862).

Mad river.—This stream has its outlet at about a mile north of Humboldt bay. It averages about 100 yards in width, with a bar at its entrance that prevents egress; but the vast amount of timber in the valley must eventually find a passage through a canal to the north-west point of Humboldt bay. A deep slough from the latter is said to approach quite close to Mad river, thus favouring the execution of such a project.

Trinidad Head and Light.—From the bar of Humboldt bay the coast trends $17\frac{1}{2}$ miles in a N. $\frac{1}{2}$ W. direction to Trinidad head, which bears North 89 miles from cape Mendocino. The low sand beach off Humboldt continues past Mad river to within 2 miles of Trinidad bay, when it changes to a bluff, guarded by innumerable rocks. For the entire distance of the low beach a depth of 10 to 15 fathoms may be found at one mile from the shore.

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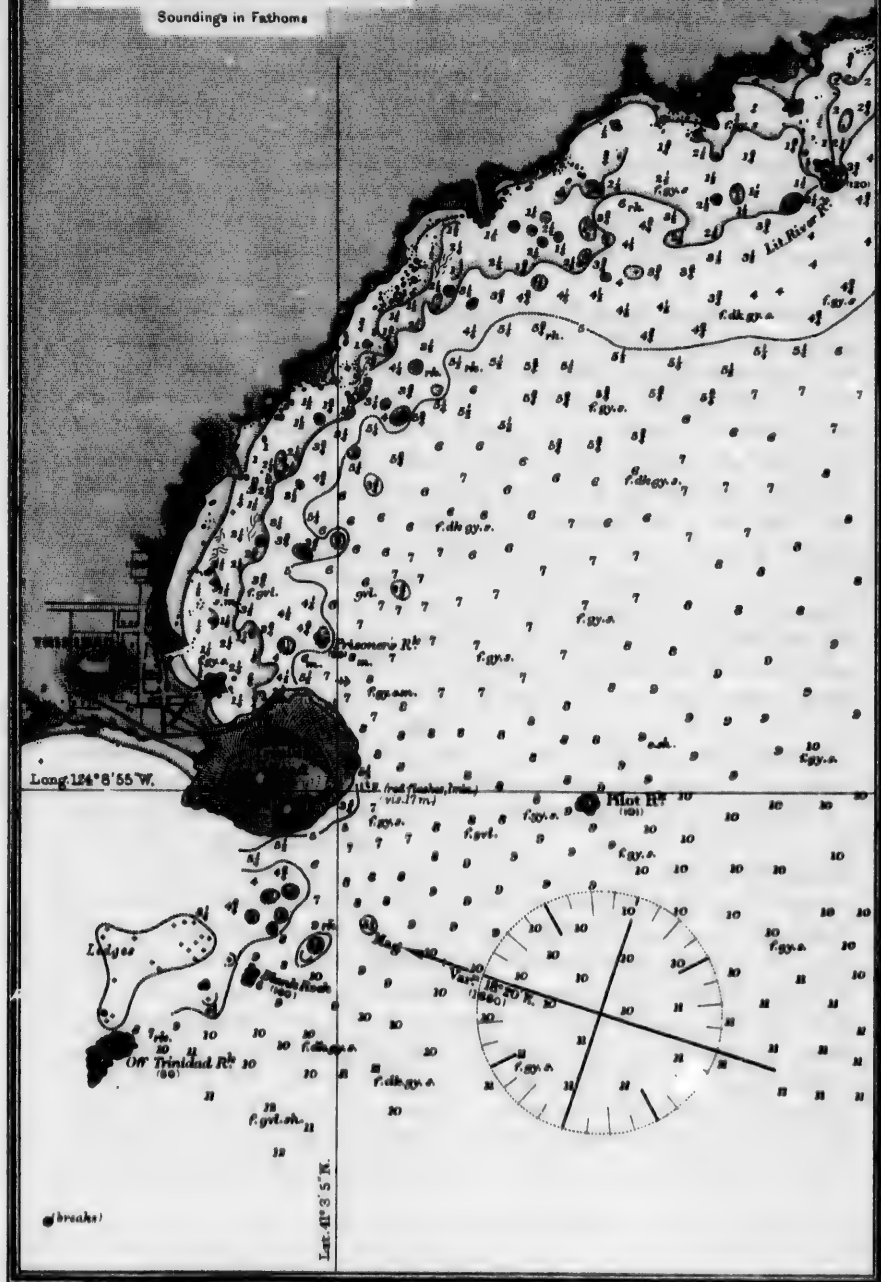
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TRINIDAD BAY

Half Nautical Mile
0 1 2 3 4 5 Cables

Soundings in Fathoms



A pyramidal brick tower, painted white, on Trinidad head, exhibits a *flashed white* light *flashing red* at intervals of one minute. The light is 198 feet above the sea and visible 17 miles. Its geographical position is lat. $41^{\circ} 8' 4''$, long. $124^{\circ} 8' 56''$.

TRINIDAD BAY.—The bay or roadstead of Trinidad (or Shó-ran), on the south-east side of the headland, is of very limited extent, but as the water is deep, and all known dangers are visible, it forms a moderately good summer anchorage. The head, forming the western shore of the roadstead, and a prominent mark when seen from close in, is about 880 feet high, and covered with a low, thick undergrowth of scrub bushes; it has very steep sides, and close to its southern base is a depth of 8 fathoms. Off its western face, for nearly half a mile out, lie several high rocky islets; between these islets and Trinidad head are numerous sunken rocks. A rock, known as the Pilot, 101 feet high, lies half a mile south of the head, having soundings of 8 and 9 fathoms close to it. From the south face eastward to the 8-fathom curve the distance is one mile, and the depth of the bight northward of this line is about half a mile, with half a dozen rocks lying outside the 8-fathom line, but well above water. In the northern part of the bay there is a sand beach extending about half a mile; thence eastward the shore is very rocky, being lined with rocky islets and shoals. The town, formerly a place of importance, fronts the north-west part of the roadstead, and the boat landing is on the north side of a round knoll making out about 100 yards from the low neck running to the head. A wharf is, or was, built here, at which vessels lie to load lumber. A considerable quantity of seaweed lies off the shore.*

When working into the anchorage beat in holdly past the outermost rock until the rock just off the eastern side of Trinidad head is in range with the knoll (having a few trees upon it) between the town and the head, with the south face of the head bearing W. by N., and anchor in 7 fathoms, hard bottom, within one-third of a mile of the rock and head, having the neck visible westward of the knoll, and a sugar-loaf rock beyond the neck showing over it. A swell will generally be found setting in.

Trinidad bay is a dangerous anchorage during winter, and if a vessel is unluckily caught in it, her chances of riding out a south-easter are bad. Several Spanish vessels were wrecked here when it was visited by them, and a number of vessels have been lost within the last few years.

From Trinidad head the shore runs N.W. by N. for about 5 miles; and is remarkably broken and rocky, terminating in a headland, known as Rocky point. At about one mile off this point are several rocks known as the 'Turtles,' southward of which distant about $1\frac{1}{2}$ miles is the Cone rock, also a mile off shore.

From Rocky point the shore takes a gentle sweep eastward, making its greatest indentation at the north end of the once famous Gold bluff, in lat. $41^{\circ} 24'$, long. $124^{\circ} 8'$, and then trending westward to Crescent City. Gold bluff has an extent of 10 miles, and is very bold and high.

Between Rocky point and Gihon bluff, which is the first one to the northward, there

* The town of Trinidad is nearly deserted during winter, but a brisk trade is carried on in summer. The land in this vicinity is very rich and well adapted for agriculture. The red-wood trees grow in the neighbourhood and attain an enormous size.

is a stretch of low sand beach, immediately behind which is an extensive lagoon several miles in length, and from a quarter to one mile in width. It lies parallel with the beach, and at some seasons is not connected with the ocean, but at others an opening exists at the northern extremity. The Indian name of the lagoon is *Æ-shœ-shô-ran*.

Redding rock.—At $4\frac{1}{2}$ miles from Gold bluff is the islet known as Redding rock, which is situated in lat. $41^{\circ} 21'$, long. $124^{\circ} 10' 30''$. It is an isolated rocky islet about 100 feet high, having all round it an average depth of 20 fathoms, with apparently no outlying dangers. The islet is about half a mile in circuit and its summit consists merely of a narrow ridge of quartz rock. It has been asserted that a reef, commencing at the shore 2 miles above the rock, stretches out towards it.

Klamath River.—The mouth of this river is in lat. $41^{\circ} 38'$, long. $124^{\circ} 5'$. It is, perhaps, 200 yards wide, having a long sand spit on the south side running north-west, and parallel with the high hills that form the north shore. South of the entrance for $1\frac{1}{2}$ miles are outlying rocks, and at the north side of the entrance are several others. It is reported that the depth upon the bar is about $2\frac{1}{2}$ fathoms. Upon passing it in 1858, within less than a mile, the sea was breaking across it, and no appearance of a safe channel was presented. Small schooners are occasionally able to enter it; but the mouth was completely closed in the winters of 1851 and 1860, and the bar changes with every change of heavy weather.

At 8 or 4 miles northward of Klamath river is a small sharp indentation at the mouth of a gulch, off which lie one large and several small rocks; but from a distance of $1\frac{1}{2}$ miles the surveyors were unable to determine whether any stream opened here. It has, however, received the name of False Klamath, because it has misled small coasters seeking for the Klamath, although there is no sand point on either side, as exists at the latter. The coast thence continues bold for several miles, when the hills begin to recede and the shores present many pleasant slopes, unincumbered with forests and now under cultivation. The shore is low and regularly sweeps to the westward for a couple of miles, forming the roadstead of Crescent City.

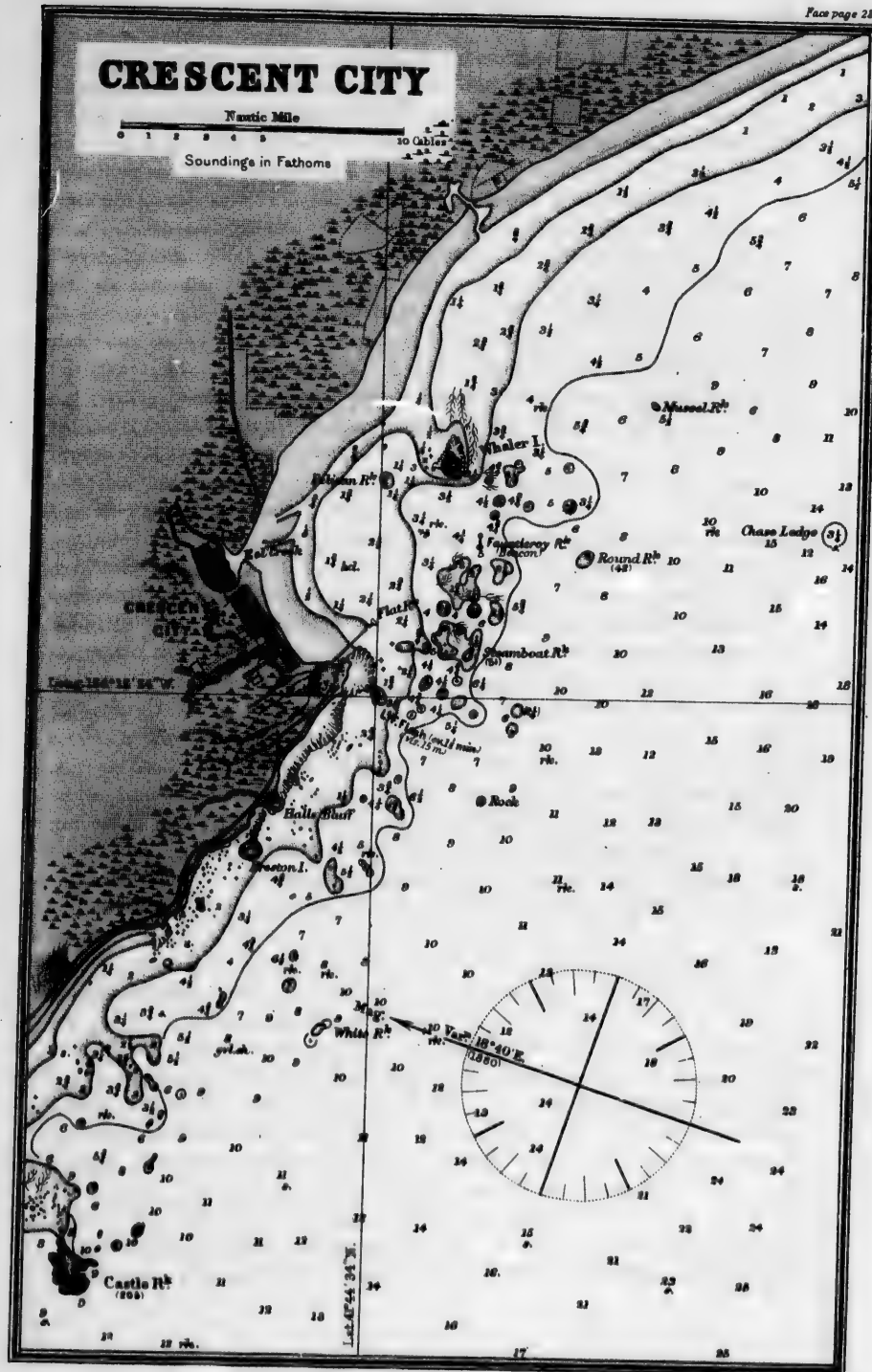
Between Klamath river and Crescent City bay are several outlying rocks. The Sister rocks, above water, lie half a mile off the coast, in about lat. $41^{\circ} 40'$, $5\frac{1}{2}$ miles southward of Crescent City lighthouse.

A dangerous sunken rock lies one mile off the point near Wilson creek; it is distant 4 miles S.E. by S. from the Sisters and half a mile W. by S. from Far island. The rock is about 4 feet in diameter, has only 3 feet water over it, and 15 fathoms close-to all round; the sea rarely breaks upon it, and there is no help to mark it.

CRESCENT CITY BAY.—This, the most dangerous of the roadsteads usually resorted to on the coast, has acquired much importance on account of the town (Crescent City) being the depôt for the supplies of miners working the gold diggings on the Klamath, Trinity, and Salmon rivers. It is filled with sunken rocks and reefs, and has a considerable number showing above water. No vessel should think of gaining an anchorage here without a pilot, or perfect knowledge of the hidden dangers. In the approach to the bay there is a sunken rock known as the Chase ledge; it is several hundred yards in extent, has $8\frac{1}{2}$ fathoms water over it and 18 to 14 fathoms all round. This danger is distant nearly a mile S.S.E. $\frac{1}{2}$ E. from Round

CRESCENT CITY

Nautic Mile
0 1 2 3 4 5 10 Cables
Soundings in Fathoms



LONDON, James Innes & Son.



rock, and S. by W. $\frac{1}{2}$ W. 8 cables from Mussel rock ; being $1\frac{1}{2}$ miles off shore and directly in the course of steamers to and from southward of Crescent City it is considered highly dangerous, especially as it is not well marked by kelp. The usual anchorage is on a line between the lighthouse and the north side of the large islet (Whaler island) three-quarters of a mile east of it, in $8\frac{1}{2}$ fathoms, hard bottom. To reach this position steer for Round rock (42 feet high, S.E. $\frac{3}{4}$ E. seven-eighths of a mile from the lighthouse) ; pass it on either side, giving it a berth of 50 yards. Thence steer towards Fauntleroy rock, on which is, or was, an iron beacon painted red, 25 feet high ; pass close to this rock, leaving it on the port side ; then haul up and anchor in $8\frac{1}{2}$ fathoms with Flat rock in line with Battery point. It is necessary to keep Fauntleroy rock close aboard, because a sharp-pointed rock, having only 2 feet water upon it, lies 200 yards to the eastward of it. To enter or leave at night, as is done by the mail and coasting steamers, requires a perfect local knowledge of the dangers and peculiarities of the land-marks. Coasting steamers, in fine weather, usually anchor close inshore to discharge freight, which is received in lighters.

A wharf has been built out from Battery point, and landing is now easily effected in good weather ; in south-easters the breakers wash over it.

The following report (1859) shows clearly the dangerous character of the roadstead, and the knowledge required to enter it—"During the progress of the re-survey of Crescent City harbour, several new dangerous rocks were discovered ; but as they are not in the channels followed by steamers, and do not interfere with the anchorage in use, it does not seem necessary to notice them further. The rocks at that place are of a peculiar character, standing isolated like bayonets, with their points just below the surface, and ready to pierce any unlucky craft that may encounter them. After completing the survey, and a fair-way had been selected for a sailing line, a very sharp rock was found almost directly in the passage, with its point only 8 feet from the surface, and deep water all round it. This is mentioned to show that, although the greatest care was taken in the survey, the character of the points of rocks is such that it cannot be surprising if new ones be found for several seasons to come."

In summer there is always some swell here, but in winter it rolls in fearfully, and vessels must choose a position to be ready to run to sea at the approach of a south-easter.

Communication is maintained with San Francisco and other ports by mail and coasting steamers, which generally carry as many passengers and as much freight for this place as they carry to the Columbia river.

The town lies N.W. from the anchorage, immediately on the low shore ; old drift-logs, in some instances, forming the foundation for wooden houses. In August 1858, there were about 185 houses of all descriptions. In 1860 the population was 558, and the number of houses 176. The lands adjacent are being cultivated ; a grist-mill has been built which turns out 75 barrels of flour per day, and a good trail leads to the "diggins" on the Klamath and Illinois rivers. The S.W. point of the bay is elevated about 25 feet and this height continues to the westward.

Light.—The lighthouse at Crescent City bay stands on the rocky islet about 800 yards from the point, which is connected to it at low tides by a broken mass of rocks,

over which a single foot-bridge is constructed. It shows a *fixed* light varied by a *flash* every $1\frac{1}{2}$ minutes at 80 feet above the sea, visible 14 miles; its geographical position is lat. $41^{\circ} 44' 84''$, long. $124^{\circ} 12' 23''$, and from it cape Mendocino bears S. by E., $79\frac{1}{2}$ miles.

Tides.—The (approximate) corrected establishment of the port at Crescent City is 11h. 44m. The mean rise of tides, 4.7 feet.*

Point Saint George.—From Crescent City light the coast trends W. by N. $2\frac{1}{2}$ miles to point St. George, which rises to the height of 150 feet, with table-land some distance back. It is bounded by hundreds of rocks, some of which rise perpendicularly 200 feet from the water. Three or four of the largest present a remarkably white appearance, which serves to distinguish this point. The extensive reef in its vicinity may have led to confusion among the old discoverers, by their confounding it with cape Orford.

Crescent City Rocks.—The rocks and reef extending W.N.W. from point St. George for a distance of 7 miles are known as the Crescent City or Dragon rocks. There is a passage inside the reef, which is invariably used by the mail and coasting steamers, when entering or leaving Crescent City bay. There are ten or twelve outlying rocks, and many sunken ones, with the passage running between them and those close to shore. This passage is about a mile in width, has 10 fathoms in it, and the general course through is nearly N.W. and S.E., but not straight. Among the multitude of rocks on the land side of the passage are three very large and prominent ones about 200 feet high. It has been already stated that several of the largest rocky islets have a well-marked white appearance, occasioned in part by the deposits of sea birds.

Pelican Bay.—From point St. George the coast runs straight for 12 miles N. $\frac{1}{2}$ W.; thence W.N.W. for 9 miles, and forms an indentation, named Pelican bay. For 10 miles from point St. George the shore is low for some distance back, and fronted by a sand beach to the mouth of a small stream known as Smith river, the northern bank of which consists of a low perpendicular bluff. The approximate geographical position of the mouth of Smith river is lat. $41^{\circ} 55'$, long. $124^{\circ} 12'\frac{1}{2}$.

Half-way between Crescent City and the mouth of Smith river there is a small sheet of water called lake Earl. North of this small stream the coast acquires an elevation of about 100 or 200 feet for a short distance inland, and is bounded by high mountains.

From point St. George, the coast northward is composed of high steep precipices

* In the interior, along the coast just described, there is a range of very high mountains running in a direction parallel with the shore, the summits of which can be seen in clear weather above the hills which form this iron-bound coast. One of these mountains, named mount Shaste, is always covered with snow, and appears as though composed of large blocks of rock; its conical shape indicates its volcanic character, although no crater is visible. The position of this mountain is about lat. $41^{\circ} 20'$, long. $121^{\circ} 45'$. The party under Captain Wilkes, U.S.N., had a fine opportunity of observing this mountain, when travelling overland in 1841. "It presented a magnificent sight, rising as it does to a lofty height, its steep sides emerging from the mists which envelope its base, and seem to throw it off to an immense distance; its cleft summit gave proof of its former active state as a volcano. The snow lies in patches on the sides and part of the peak of this mountain; but there is a great difference in the position of its snow-line from that of mount Wood, or St. Helen's. Its height is said to be 14,890 feet.

† Abreast the north side of the entrance of Smith river and distant about 2 miles from the coast is a sunken rock, with only 12 feet water over it; it is named Hassler rock.

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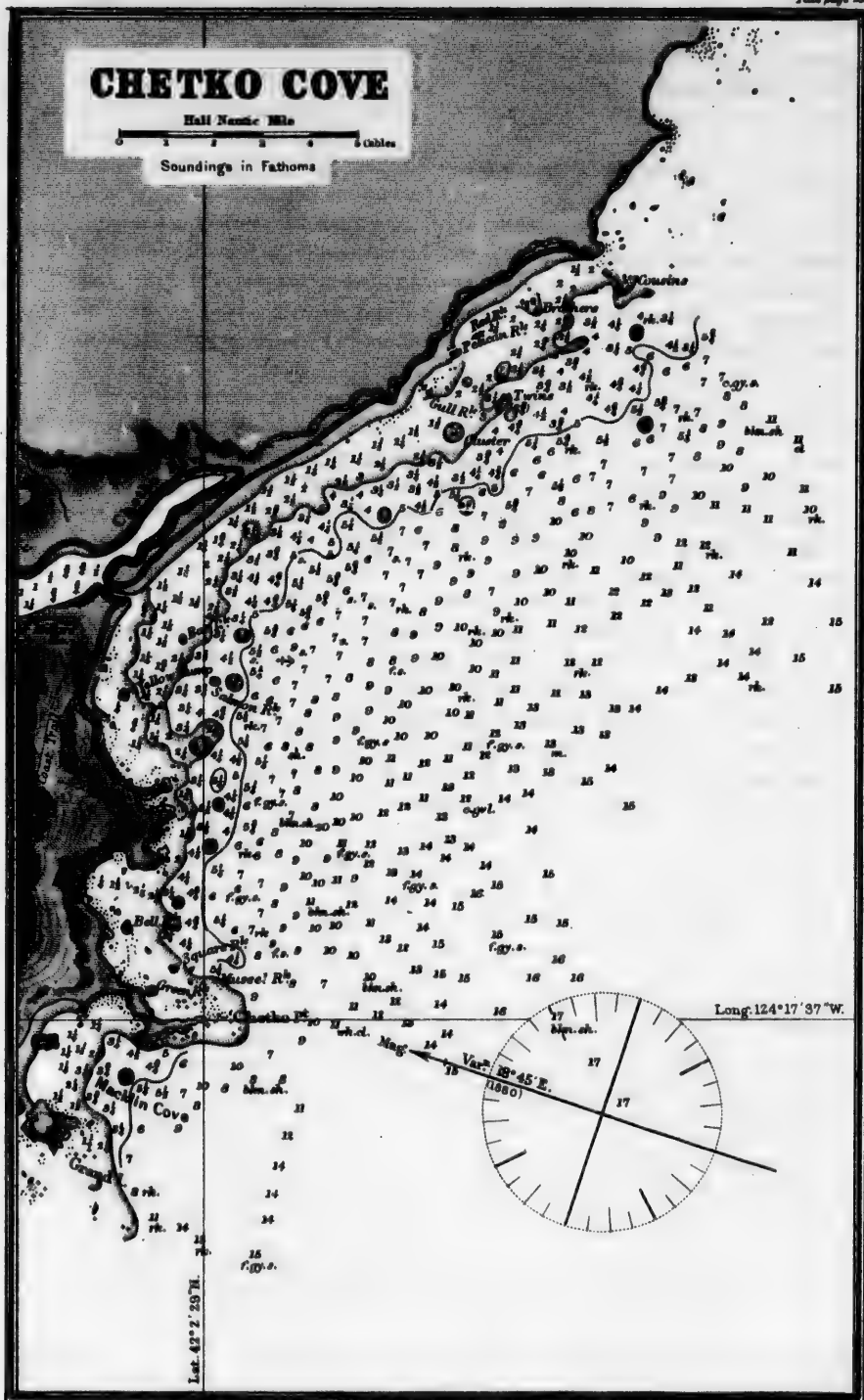
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CHETKO COVE

Half Nautic Mile

0 1 2 3 4 5 Cables

Soundings in Fathoms



and deep chasms, falling abruptly into the sea. The inland mountains are very lofty, and appear to be tolerably well covered with trees, apparently pines, although there are some spreading trees of considerable magnitude. Some of the mountains are barren. Along the coast are a number of rocky islets.

Boundary.—About 4 miles northward from the head of Pelican bay, the boundary line of California and Oregon, in lat. 42° , strikes the coast near a remarkable high pyramidal mound, rising abruptly from the plateau, which is destitute of timber.

Chet-ko Cove.—Northward of Pelican bay, and in lat. $42^{\circ} 2' 29''$, long. $124^{\circ} 17' 37''$, empties the Chet-ko river, a stream which is 50 to 60 yards wide at its mouth, with banks about 100 feet high, and bounded half a mile in shore by very high hills. It appears deep and sluggish, and in August 1853, was completely closed at the mouth by a gravel beach. The anchorage in the cove off the mouth of the river is in 6 to 9 fathoms; it is open and exposed from West to South, with several reefs and islets in and around it. The shores of the bay, or cove, are skirted by numerous rocks and shoals, some of which extend nearly half a mile out.

The Indian name of this stream is Chit-ko.

Mack Reef.—About 12 miles north-westward from Chetko cove is an anchorage, in 6 fathoms water, inside a group of rocky islets, the southernmost and most conspicuous of which is known as Mack Arch. This rock is 226 feet high; it has an arched appearance in consequence of having a large opening through it, and is distant about three-quarters of a mile off the shore, southward of Mack point. Its geographical position is lat. $42^{\circ} 18' 37''$, long. $124^{\circ} 24' 46''$.

Vessels can steer in for the anchorage, with Mack Arch on any bearing from N.W. by N. to E. $\frac{1}{4}$ N. When distant about 2 cables from the Arch, and carrying not less than 15 fathoms water, the course changes to pass to the eastward of the Arch, not nearer to it than 50 yards, and then leads along the line of the reef towards its inner or northern end, where the reef appears to join the shore. With Mack Arch bearing S. by E. $\frac{1}{4}$ E., and Mack point N.N.E. $\frac{1}{4}$ E., there is good anchorage $1\frac{1}{2}$ to 2 cables off the reef, in $6\frac{1}{2}$ fathoms water, sandy bottom. Inside of this is an inner anchorage, separated from the outer by a thick belt of kelp, stretching from the beach to the reef, but through which there is a clear channel.

With the highest point of Mack Arch bearing S. $\frac{1}{4}$ E., the course through the channel leading to the inner anchorage is N. $\frac{1}{4}$ W., to 4 fathoms water; care is necessary to avoid a *sunken rock*, with only 2 feet on it at low water, which lies at the edge of the kelp on the eastern side. From the northern or inner end of the channel, the course leads to the westward, and good anchorage is had just inside the kelp, in 4 to 5 fathoms water, sandy bottom—Mack point bearing E. $\frac{1}{4}$ N., and Mack Arch S. by E. $\frac{1}{4}$ E.

There are passages between the rocks, leading into the inner and outer anchorages, apparently free from danger; but it is recommended that they should not be used until they are closely surveyed.

Wood and water can be obtained here, but no other supplies.

The coast between the Chit-ko and Mack point is high, bold, compact, and bordered

by vast numbers of rocks, with very deep water close in shore. From Mask point the shore runs nearly N.W. by N. $\frac{1}{4}$ N. for 40 miles to cape Orford, making a long gentle curve of 4 miles to the eastward, and being in general high, abrupt, and rocky.

Rogues River.—Within the long stretch just referred to is found the entrance of Rogues river, in lat. $42^{\circ} 25'$, long. $124^{\circ} 22'$, (both approximate), having a long low sandy point on the south side, and a high steep hill, with two large rocks off its base, at the north side. It comes from the interior between high mountains, and it is next to impossible to travel along its course. The stream is very rapid, and, at a short distance within the bar, is reported to have a depth of 4 or 5 fathoms. Just within the entrance and on the north side were large Indian villages in 1858. When passing it in moderate north-west weather the sea was observed to be breaking heavily across the bar, and this is reported to be generally the case. It has not been surveyed, and the depth of water on the bar is variously reported to be from 10 to 18 feet; the former is doubtless nearer the truth. Lieutenant McArthur, of the U.S. Coast Survey, reports 10 feet on the bar, and that the channel is too narrow for sailing vessels to turn in. In the spring of 1850 the New York pilot-boat *W. G. Hagstaf* entered the river, and we believe was attacked by the Indians, deserted, plundered, and burnt. The schooner *San Roberts* entered the river in July of the same year, but got out safely.

Near the entrance to Rogues river commences the detached deposits of auriferous sand and gravel, which are found northward along the coast to the Coquille river.*

Rogues River Reef.—At a short distance northward from Rogues river is the Rogues River reef, the rocky islets composing which are not so large as the Dragon rocks, and run more nearly parallel with the coast line. The southern group of rocks lies W. $\frac{1}{4}$ N., about 4 miles from the north head of the entrance to Rogues river, and stretches northward 8 miles, where a gap occurs between them and another cluster lying $1\frac{1}{2}$ miles from the shore. Off this inner group lie several dangerous sunken rocks, which must be sharply watched from aloft when the sea is not heavy enough to break upon them. As seen from southward, the inside rock of the outer group shows a perpendicular face eastward, and sloping back to the west. The channel through this reef is perhaps a mile wide, but more dangerous than any other on the coast. No hydrographic survey has been made of it, and it is never used by the coasting steamers. In 1858 the Coast Surveying steamer passed through it.

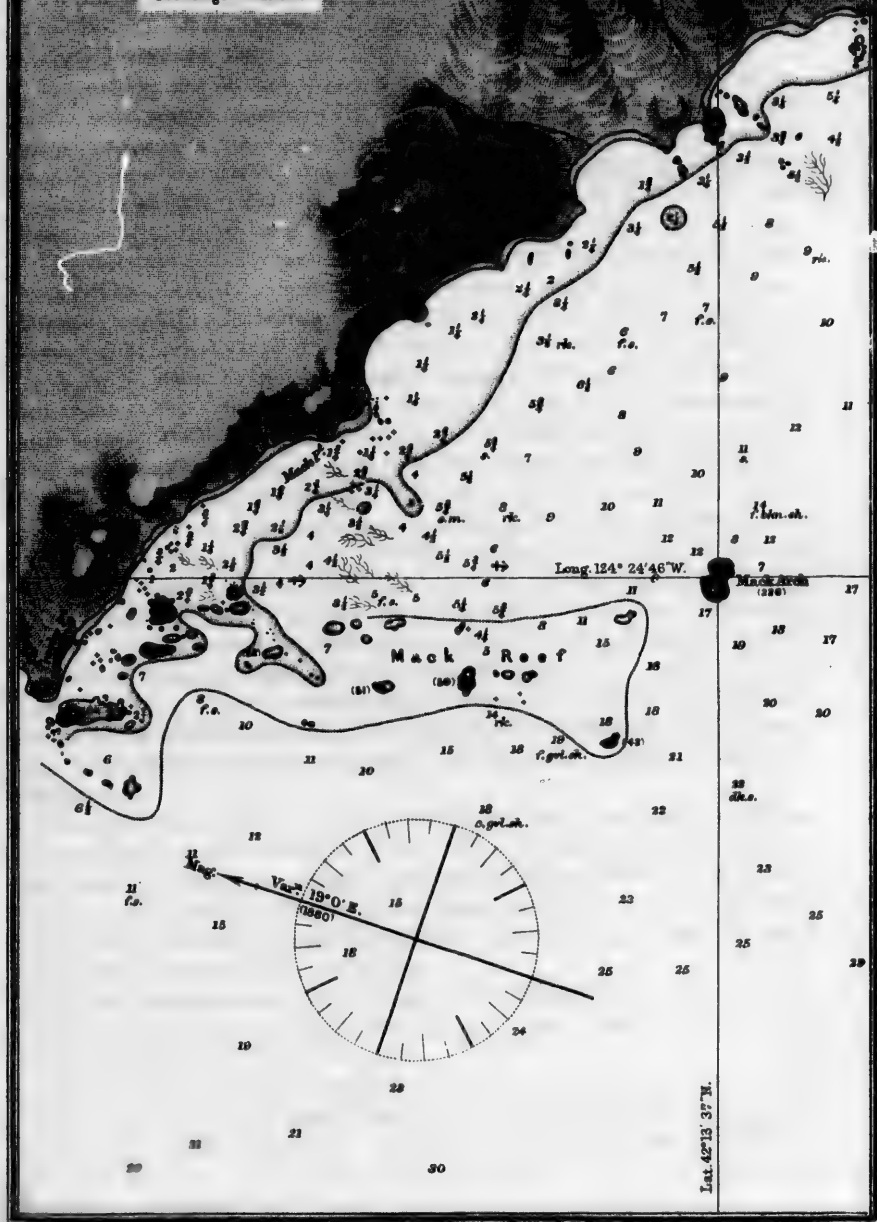
Abreast of the northern part of this reef is a 5 mile stretch of low sand beach, backed by high, rugged, wooded hills, when the shore changes to an abrupt and precipitous face to port Orford. Many rocks closely border the shore, and 5 miles south of port Orford a high rocky islet lies nearly a mile off the base of the hill, about 1000 feet high.

PORT ORFORD.—This is the best summer roadstead on the coast between point Reyes and the strait of Juan de Fuca. From the extremity of the western point east-

* The name of the river was suggested by the dishonest propensities of the natives in its vicinity. On maps it is variously named Toutounis, or Too-too-tut-na, or Klamet. The Rogues river Indians have long borne the character of being a warlike and troublesome race.

MACK REEF ANCHORAGE

Half Nautical Mile
SOUNDINGS IN FATHOMS



LONDON, James Innes & Son.



ward to the main shore the distance is 2 miles, and from this line the bend of the shore northward has a depth of one mile, forming port Orford. The soundings within this space range from 16 fathoms close to Tichenor rock, forming the western point of the bay, to 8 fathoms within a quarter of a mile of the beach on the north-east side; with 5 fathoms at the base of the rocky points on the north-west side towards Tichenor rock. One mile off the shores of the bay the average depth is about 14 fathoms, regularly decreasing in-shore.

The point forming the western part of the bay presents a very rugged, precipitous outline, and attains an elevation of 850 feet. Its surface is covered with excellent soil and with a sparse growth of fir. From this point the shore becomes depressed to about 60 feet at the northern or middle part of the shore of the bay, where the town, or village, is situated. The hills behind are covered with a thick growth of fir and cedar.

The anchorage is usually made with the eastern end of the town bearing North, being just open east of a high rock on the beach, in 6 fathoms water, hard bottom, having a sharp high point bearing N.W. by W. a quarter of a mile distant, the beach in front of the town distant a quarter of a mile, and three rocks just in the 8-fathom line E. by N., distant half a mile. Steamers anchor a little eastward of this position, and closer to the town, in 4 fathoms. Coasters from the south in summer beat up close in-shore, stretching inside of the outlying islets to avoid the heavy swell outside. Coming from northward they keep just outside of a high rock a third of a mile off the western head, and round Tichenor rock within half a mile. In winter vessels should anchor far enough out to be ready to put to sea when a south-easter comes up.

The usual landing is north of the anchorage, between the rock named Battle rock and the point of rock close on its west side. A road is cut from here up to the town, which consists of but a few houses. Sometimes a landing is made on the beach a quarter of a mile westward of Battle rock, in the bight, where a sloping grassy bluff comes to the water; but this landing is over a rocky bottom.

At the head of the bay, a mile eastward of its western point, is a group of rocks which extends off shore about half a mile; another cluster of rocks lies off Coal point, the rocky point forming the south-eastern limit of the bay. Several streamlets fall into the bay.

Several attempts have been made to open a road from this place to the mines, about 60 to 70 miles eastward, but hitherto without success. Upon the opening of such a road it would become a large depôt of supply for the interior. In the neighbourhood of port Orford are found immense quantities of the largest and finest white cedar on the coast, and for some years a saw-mill has been in operation, affording a small supply for the San Francisco market.

The high mountain about 12 miles east of port Orford is known as the Pilot knob. The approximate geographical position of the western point of port Orford is lat. $42^{\circ} 44' 20''$, long $124^{\circ} 30' 40''$.

Tides.—The corrected establishment at the port is 11h. 26m. The mean rise and fall of tides is 5.1 feet; of spring tides, 6.8 feet; and of neap tides, 3.7 feet.

Elk River.—From the western extremity of port Orford, cape Orford bears

N.W. $\frac{1}{2}$ N., distant $6\frac{1}{2}$ miles, the shore line between them curving eastward about a mile. About one mile N.W. by W. from Tichenor rock is another rock named Klooqueh, lying to the westward of the port. The shore immediately north of port Orford is composed of a very broad loose sand beach, backed by a long uniform sand ridge 100 feet high, covered with grass, and a few firs; while behind this the ground falls and forms lagoons and marshes. This ridge extends nearly to the mouth of a stream named Elk river, $4\frac{1}{2}$ miles from Tichenor rock. It is a narrow stream, fordable at its mouth at low tides, which comes for miles through broad marshes covered with fir and white cedar, and an almost impenetrable undergrowth. The south side at the mouth is low, sandy, and flat; the north side, a slope rising from the marsh in-shore and terminating on the beach in a perpendicular bluff, averaging 100 feet high, covered with timber to its very edge for a couple of miles, when the timber retreats some distance inland. At its base a sand beach exists which may be traversed at low water.*

CAPE ORFORD and Light.—When making cape Orford (or Blanco) from northward or southward it first has the appearance of an island, because the neck connecting it with the main is comparatively low, flat, and destitute of trees, the cape itself being heavily covered with trees to the edge of the cliff. It is, perhaps, over 200 feet high, but the trees upon it make it appear at least 100 feet more. The sides are very steep, and worn away by the action of the sea, showing a dull whitish appearance usually, but bright when the sun is shining upon them. At the base are many black rocks and ledges stretching out to form the inner part of Orford reef. In the bend, south-east of the cape, rises an isolated rock of considerable elevation, about 100 yards from the beach. The approximate geographical position of the cape is lat. $42^{\circ} 50'$, long. $124^{\circ} 38'$; it is consequently the most western part of the main land until we reach latitude $47^{\circ} 50'$.

On the highest part of the cape is a circular brick tower (white), from which is exhibited a *fixed white* light, at 256 feet above the sea, visible 28 miles. The light is shown over an arc of 220° (from S.E. $\frac{1}{4}$ S. westward to North).

From this headland cape Mendocino bears S. by E. $\frac{3}{4}$ E., distant 145 miles; cape Disappointment light, at the north side of the entrance to the Columbia, N. by W. $\frac{1}{4}$ W., distant 207 miles; and Tatoosh island light off cape Classet N.N.W., 882 miles. From the line joining capes Orford and Disappointment the coast does not, in any place, leave it more than 12 miles.

Orford Reef.—At about 4 miles from the coast, between port and cape Orford, lies a group of rocky islets and sunken rocks, known as Orford reef. There are seven large high rocks within an area of one square mile, with small ones that are just awash, and others upon which the sea only breaks in very heavy weather.

The south-eastern rock named Fin has a perpendicular face to the south-west, with a sloping surface to the north-east; near it are several low black rocks. Fin rock lies

* At the mouth of the Elk river, a bottle nearly buried in the sand, was picked up on the 18th of May 1860, with a memorandum, stating that it had been thrown from the steamship *Brother Jonathan* in lat. $42^{\circ} 0'$, long. $124^{\circ} 50'$, on the 23rd of March 1860, the wind at the time strong from the southward. It had travelled nearly North about 50 miles.



W. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles from the western point of port Orford, and the general direction of the six others is N.N.W. from this rock. West from port Orford, and distant $4\frac{1}{2}$ miles, is a small black rock, and near it a smaller one, upon which the sea breaks only occasionally. W. by N. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles from port Orford, lies the largest of the seven islets, rising up with high and perpendicular sides. On the same course, and $1\frac{1}{2}$ miles farther out is a small rock, and half-way between them a rock awash. This is the northern limit of the group.

Stretching S.S.W. for $1\frac{1}{2}$ miles from cape Orford are numerous rocky islets and sunken rocks, with large fields of kelp; but ceasing at that distance, a passage is left $1\frac{1}{2}$ miles wide between them and the northern islets of the other group. There is a passage with 10 to 14 fathoms water between Orford reef and the dangers (Blanco reef) off the point, which is in constant use by mail and coasting steamers, but great care is necessary to avoid the sunken rocks on either side.

One mile north of cape Orford empties the Sixes, a small stream having a great number of rocks off its mouth. The village upon the Sixes is named Te-chéh-quut.

THE COAST.—From cape Mendocino the hills upon the seaboard range from 2000 to 3000 feet high, running parallel with the coast at a distance of 3 to 5 miles, receding somewhat at the Eel river valley and point St. George, and at other points coming abruptly to the ocean. The whole face of the country is covered with dense forests, and offers almost insurmountable obstacles to the opening of roads intended to strike the trail leading along the valleys of the Sacramento and Wallamut.

Northward of cape Orford the appearance and nature of the coast assumes a marked change. Long reaches of low white sand-beach occur, with sand-dunes, broken by bold rocky headlands, and backed by high irregular ridges of mountains. On the sea-face and southern sides of many of these prominent points no timber grows, but they present a bright green appearance, being covered with fern, grass, and bushes. The general altitude of the mountains appears the same as to the southward.

Coquille River.—From cape Orford to the mouth of the Coquille, in lat. $48^{\circ} 7'$, the coast runs North for 17 miles, with a slight curve of $1\frac{1}{2}$ miles eastward, and a short distance north of cape Orford consists of a low sand beach, immediately behind which are long shallow lagoons receiving the water from the mountains, but having no visible outlet to the sea. Along this shore the soundings range from 7 to 15 fathoms at a distance of a mile.

The south point of the entrance to Coquille river is a high bluff headland, whilst the north point is a long low narrow spit of sand, overlapping, as it were, the southern head, so that the channel runs parallel with and close under it (1851). A short distance off it lie several rocks, but not of sufficient size to lessen the western swell which breaks continually across the bar.

The widest part of the mouth is less than 200 yards, after which the river spreads out into a large sheet of shallow water, about 2 miles long by three-quarters of a mile broad, and bounded by low ground. Into the north-east part of this lagoon enters the river, which has been followed a distance of about 80 miles in a north-easterly direction, and having a depth throughout of not less than 15 feet, and an average width of 40 yards. It drains a very fertile region, densely covered with many varieties of wood.

Numerous Indian encampments were found along its banks from the mouth, and quite extensive fish weirs were discovered and destroyed. About 15 miles from its mouth there is a portage of 1½ miles to Koos river.

In 1859 the officers of the Coast Survey found only 8 feet of water on the bar, and it is reported inaccessible for vessels of ordinary draught. The north point is a long stretch of dreary sand-dunes, and has an isolated bold rock at its southern extremity. The channel makes out straight from the southern head, and north of the rocks (1859.) The approximate geographical position of its entrance is lat. 48° 7', long. 124° 24'.

Tides.—The (approximate) corrected establishment is 11h. 30m., and the mean rise and fall of tides 5 feet.*

CAPE ARAGO and Light.—Between the Coquille river and this headland a low sand-beach continues for 10 miles to the southern part of cape Arago (or Gregory) which rises up very precipitously; the hill (attaining perhaps 2000 feet elevation 2 miles back) runs in a straight line northward for 3 or 4 miles, and bounded by many rocks, slopes northward to a sharp perpendicular point, about 60 feet high, and peculiarly cut and worn by the action of the sea; thence it takes a sharp turn to the E.N.E. for 2 miles, to the entrance to Koos bay. The cape, as seen from southward, shows a couple of rocks a short distance from its western point. Along the low shore soundings in 10 fathoms are found at a mile off. It has been asserted that vessels anchoring close under the north face of the cape may ride out heavy south-east gales. If so, it is very important, no other place between Drake and Néé-ah bays, except, perhaps, under Destruction island, affording that protection. If a south-easter should haul to the S.W. and then N.W. as they usually do, the chances of getting out would be bad.

Upon an islet at the north-western extremity of cape Arago is a lighthouse, which shows a *fixed* light, varied every 2 minutes by a *flash*, at 75 feet above the sea, visible 15 miles. The duration of flash is 3 seconds, and that of eclipse also 3 seconds. The geographical position of the lighthouse is lat. 48° 20' 88", long. 124° 22' 11".

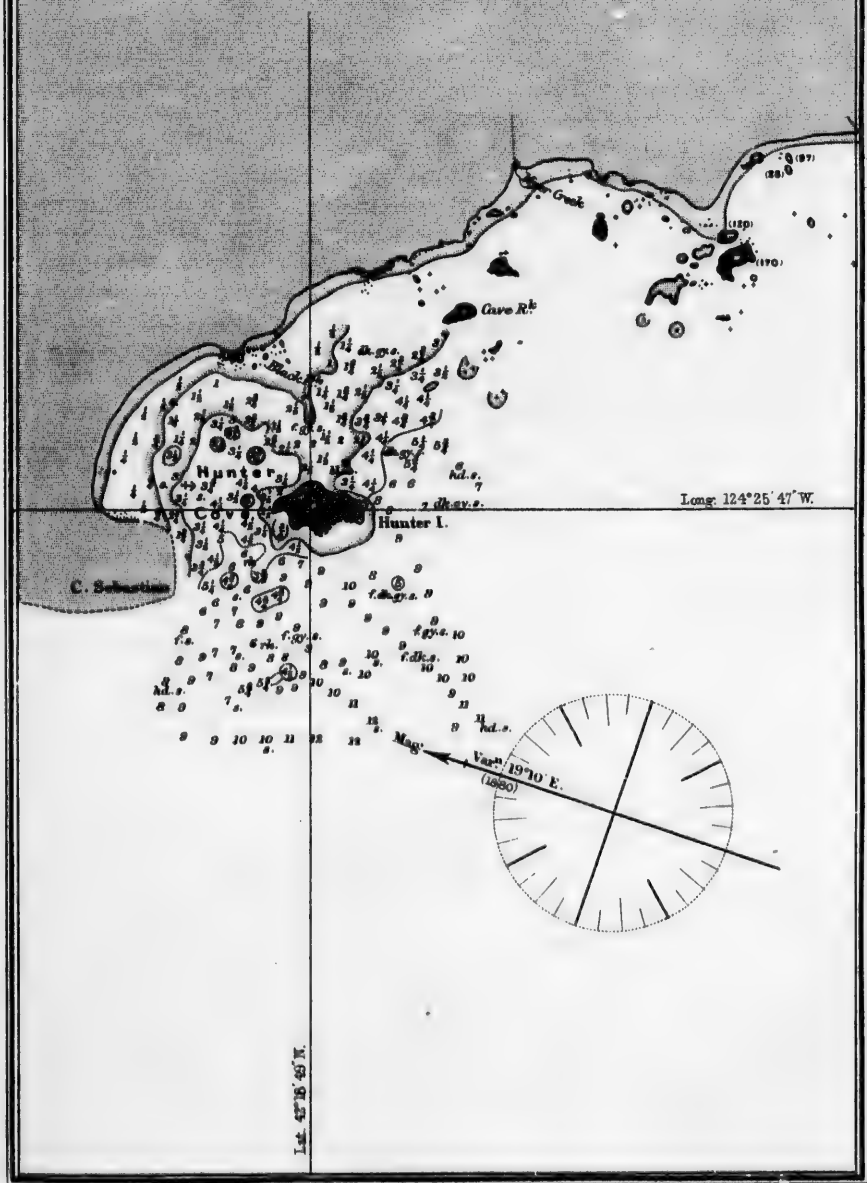
Cape Arago was seen by Captain Cook, and described by him as follows—"This point is rendered remarkable by the land of it rising immediately from the sea to a tolerable height, and that on each side of it is very low." Vancouver says—"This cape, though not so projecting a point as cape Orford, is nevertheless very conspicuous, especially when viewed from northward, being formed by a round hill on high perpendicular cliffs some of which are white a considerable height from the level of the sea; above these cliffs it is pretty well wooded, and is connected to the mainland by land considerably lower. About a league northward of the pitch of the cape, the rocky cliffs composing it terminate, and a compact white sandy beach commences, which extends along the coast 8 leagues, without forming any visible projecting point or headland."

* Mr. Davidson U.S. Coast Survey, observes "When off the entrance to the Coquille river in 1854 we saw about a dozen houses which had been built by the miners engaged in washing the auriferous sand and gravel at the back of the beach. In approaching this coast we encountered a very heavy swell, with the water changing to a dark brown colour, and after passing through it tacked off shore, hove to, and sounded near its outer limit but found no bottom with 84 fathoms of line."

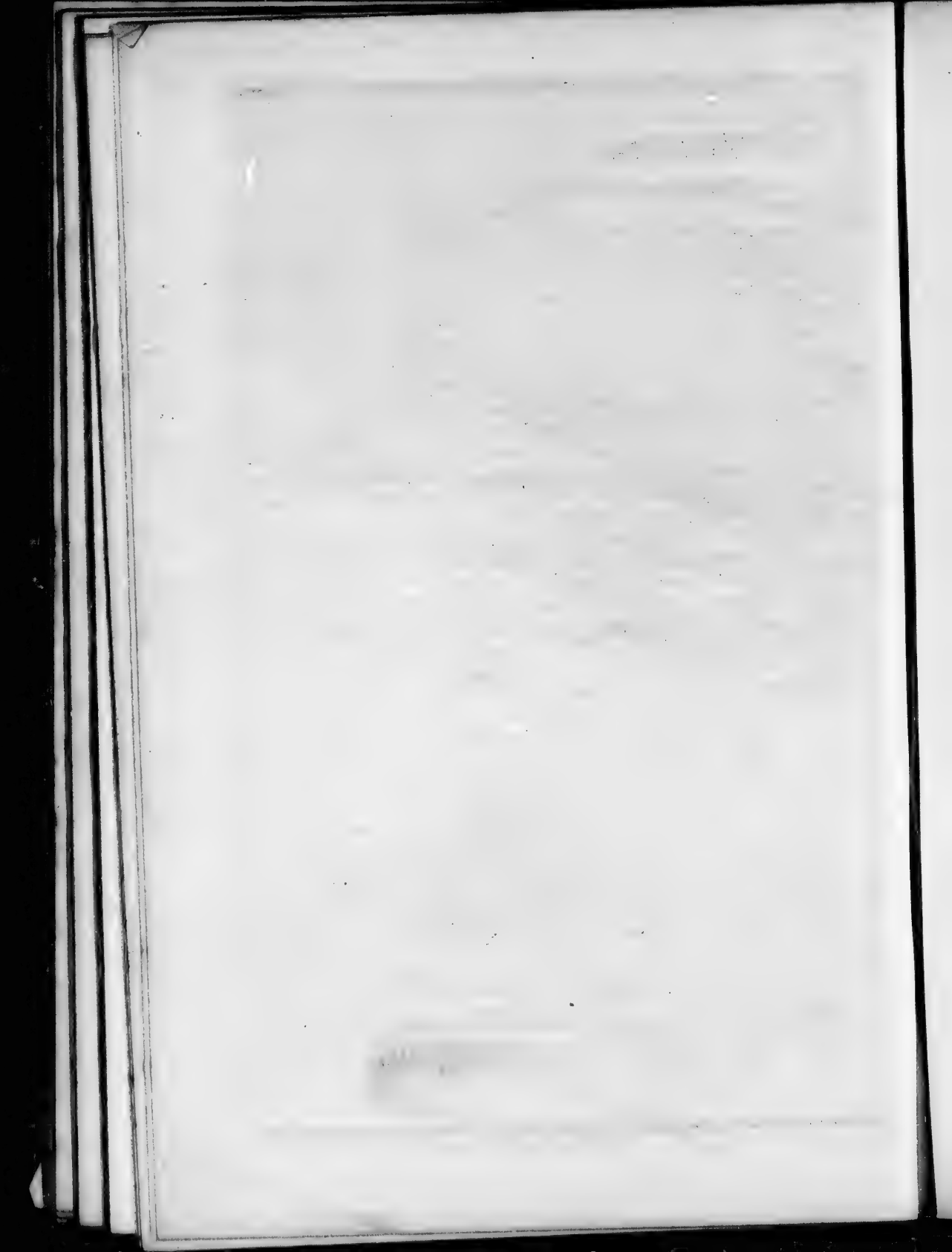
SKETCH OF HUNTER COVE

Half Nautic Mile
0 1 2 3 4 Cables

Soundings in Fathoms



LONDON: James Innes & Son.



KOOS BAY.—At nearly 2 miles E.N.E. from the northern extremity of cape Arago is the wide and well-marked entrance to Koos bay. The south point, named Koos head (off which, distant about a cable, is an isolated rock, named Guano rock), is high and bold, being the base of the hills forming the cape; it consists of a precipitous rocky bluff, extending from the inside of the entrance as far as cape Arago. The north point of the bay is low and sandy, with shifting sand-dunes that reach 100 feet in height. In 1861 a narrow channel across this point formed a tolerably large island, which was washed away before the close of the season. Such changes are constantly taking place, and involve changes in the bar and channel. The points lie nearly north and south of each other, and about three-quarters of a mile apart.

An *automatic signal-buoy*, painted black and white in vertical stripes, is moored in 15 fathoms water, outside the bar at the entrance to Koos bay. (1880).

In 1854 a depth of only 9 to 9½ feet could be found on the bar; in 1861 its maximum depth was 13 feet, and during that year the bar was observed to have moved northward. In 1865 the channel had completely changed, and ran directly from the north point of the head N. by W. ¼ W. 1¼ miles, with a very narrow mouth between the breakers, having 4 fathoms water there, but only 7 feet in the shoalest part of the channel about 6 cables from the head. The entrance to the channel had thus moved about 6 cables to the N.N.E. Vessels enter and leave on the flood tide because the bar is smoother; with the ebb there is a heavy break, unless the sea be remarkably smooth. The currents run very strong, as might be supposed from the extent of the bay and the size of the channel.

The sea has been observed to break completely across the entrance in moderate north-west weather, and in 1861 the party examining it could get but one day's work on the bar during several months in consequence of the surf.

The trade of Koos bay consists of lumber, lignite, and coal. Of the former, the laurel, myrtle, &c., are extensively used on the Western Coast in the manufacture of furniture. There are at present (1861) two saw-mills in operation, capable of turning out about 15,000 feet per day. A tug-boat is employed at the entrance for towing vessels over the bar.

Tides.—The corrected establishment at the port is 11h. 26m. The mean rise and fall of tides is 5·1 feet, of spring tides 6·3 feet, and of neap tides 3·7 feet.

The bay is very irregular in outline, and its general shape is somewhat like the letter U, with the convexity to the north. One small branch stretches southward behind Koos head; it is called the south slough, and has but 2 or 3 feet of water in it. North of the entrance the bay proper begins, and has a good depth of water. Abreast the north point the width is 3 cables, and the depth from 8 to 7 fathoms; thence northward it increases in width to nearly a mile, and runs very straight on a N. by E. ¼ E. course. The channel runs on the eastern side of this part, the western half being filled with sand flats and shallows. A sunken rock, called "Fearless", is on the eastern side of the channel, abreast the upper part of the rocky shore. The whole length of the bay is believed to be about 25 miles, the head of it being a little farther south than the entrance. Koos river empties into the head of the bay, and will give passage to boats for 20 miles from its mouth, where a small slough that

empties into the Coquille river is so near as to leave a portage of only $1\frac{1}{2}$ miles between the two waters, and about 15 miles from the mouth of the Coquille.

Excepting the peninsula, which forms the western shore of the bay north of the entrance, the entire country is an immense forest of various kinds of pine. No land for cultivation is found without clearing, and even on Koos river the bottom lands, which afford excellent soil, have to be cleared of the thick growth of laurel, maple, and myrtle. The coal mines are beyond the great bend, near the head of the bay, and on the western side.

The peninsula which separates the bay from the ocean is composed entirely of sand, some of the hills on it attaining an elevation of 100 feet. The sand has frequently been observed to shift considerably.

UMPQUAH RIVER.—North of Koos bay to the Umpquah river is another straight, low sand-beach, with sand-dunes, backed by a high ridge of hills densely timbered. The shore runs nearly North, presenting a very white appearance when the sun shines upon it, and having 10 to 15 fathoms water about one mile off the beach. The southern point of the entrance to the river is a marked spur of the mountains from the south-east, and is bordered by sand-dunes. The north side of the entrance is a long range of white shifting sand-hills, running with the coast for 2 miles, and suddenly changing to high rocky hills covered with wood. The river is the largest stream entering the Pacific between the Sacramento and Columbia rivers. It is 51 miles N. $\frac{1}{2}$ W. from cape Orford, and 21 miles north of cape Arago. The lower reach of the river is long and narrow, running nearly North for 6 miles; on the south side it is bordered by a rocky wooded shore; on the north, for 2 miles, by loose sand-hills, changing after the first mile to sand sparsely covered with coarse grass, bushes, and fir, and in 4 miles to steep high rocky banks covered with large trees. An immense flat, mostly dry at low water, stretches southward from the north point to within 800 yards of the south side of the entrance, through which narrow space runs the channel, having (1858) a shifting bar with only 18 feet upon it, and less than 100 yards wide.

In January, 1858, the bar was marked by two nun-buoys, painted white and black in vertical stripes. The inner buoy was placed just within the bar, and in $8\frac{1}{2}$ fathoms at mean low water, and could be passed on either hand, but only close to it. The outer buoy was moored just outside the bar, in 10 fathoms at the same stage of the tide, and could also be passed on either hand.*

In light weather the bar can be readily determined by the breakers on each side, but with a heavy swell the sea is terrific. In October, 1852, the Coast Survey steamer *Active* lay off the bar two days trying to get in, but found it impracticable. Several steamers have thumped heavily on the bar, one nearly carrying away her stern-post, and in 1858 the mail steamship *Columbia* in coming out had her decks swept fore and aft: in January, 1861, when going in, this steamer suffered still more terribly. Several vessels have been lost at its entrance, and within a very recent period no pilots belonged to the river, because the trade was too small to pay.

During the early part of November, 1858, the bar at the entrance to the Umpquah

* We are ignorant if this bar is still buoyed. It is subject to such great and frequent changes that a stranger must not attempt to enter the river without having the assistance of some one well acquainted with it.

changed greatly, and the depth of water upon it was so much decreased that the steamship *Columbia*, which thumped over it, could not leave the river for several weeks. Upon sounding at the entrance it was found that the channel across the bar had moved about half a mile northward of its former position.

Abreast the meeting of the sand-beach and bluff on the south side lies a rock, visible at low tide, upon the 8-fathom line; its position has not been accurately determined. From the bluff point vessels steer across the river to strike the east side of the north point about a third of a mile from its extremity, then haul across E.N.E. to the other shore, close along which the channel runs. This course takes them clear of a flat and rocks in mid-river, and bearing E.N.E. from the south end of the north point, and North five-eighths of a mile from the bluff point on the south side. The inlet, known as Winchester bay, on the west side of the entrance is shallow, being filled with an extensive mud-flat. Three miles inside the entrance the river continues half a mile wide, then expands to one mile, and is filled with numerous sand and mud flats.

The Umpquah is said to drain an extremely fertile region, abounding in prairie land well adapted to agriculture and grazing. A pine tree has been discovered in the Umpquah valley measuring 216 feet to its lowest branches, and being 57 feet in circumference. The Indian name for the river below the rapids is Kah-la-wat-set, and to the upper part they apply the name Umpt'quah.

From the Umpquah the coast runs in a remarkably straight line N. by W. $\frac{1}{2}$ W., to the south point of the entrance to Columbia river, in no case varying more than 8 miles eastward of the line joining these two places.

Heceta Bank.—N.W. by N., distant 66 miles from cape Orford, is the southern end of a bank extending parallel with the coast for 80 miles, and about the same distance from it. The least depth yet discovered upon it is 48 fathoms, and the nature of the bottom is very variable, there being blue mud, coarse blue sand, coral, pebbles, gravel, mud and shells. Coasting vessels have often reported passing over localities having a heavy swell upon them, and one frequently so reported near the Umpquah led to the examination which discovered this bank.

Heceta Head.—The seaward face of this headland is about $1\frac{1}{2}$ or 2 miles in extent, and the northern extremity is in about lat. $44^{\circ} 9'$. It is quite noticeable when coming from the southward as being the northern limit of a long extent of low sand-dunes, backed by low wooded hills, stretching from near the Umpquah river. Northward of it the shore is moderately high, but broken by sandy patches of sloping bluff. The summit of the head is about 800 feet above the sea, and covered with wood, but the seaward face is green to the edge of the cliff. Two small cascades are seen near the southern part, and a small sandy cove near the northern. To the westward of this cape lies the Heceta bank, above described.

Cape Perpetua.—After leaving the Umpquah 2 or 3 miles, a bold rocky coast, with high steep hills covered with timber, runs straight for about 8 miles, changing to low sandy beach with sand-dunes, backed by a high ridge of hills. This continues for 15 miles, when the hills stretch out to the shore and crowd upon it for 18 miles, to end abruptly in steep bluffs forming cape Perpetua. The face of the cape is nearly

5 miles long, very slightly projecting from the shore-line; it is very high, and has a regular although steep descent to the shore, bringing the trees to its edge. The approximate geographical position of the cape is lat. $44^{\circ} 10'$, long. $124^{\circ} 6'$.

From the Umpquah river to cape Perpetua, at a distance of a mile from the shore, are soundings of 8 to 14 fathoms. About 8 miles northward of Umpquah river is the entrance to Tahkenitch creek, 4 miles beyond which is the mouth of another creek which is known as Tsiltecoas river; this latter is in about lat. $43^{\circ} 53'$.

Alseya River.—At $8\frac{1}{2}$ miles northward of cape Perpetua is the entrance to Alseya river, with a broad sandy point forming the north head. This river expands nearly to the size of the Yaquina, but the depth upon the bar is unknown. For 4 miles northward of this river to the Seal rocks, near Beaver creek, the shore is marked by sand-dunes; thence to the mouth of the Yaquina river the shore is low and thickly wooded.

Northward of cape Perpetua the coast range of hills is cut by numerous valleys, through which flow many small streams to the ocean.

YAQUINA RIVER.—As seen from south-westward the entrance to this river exhibits a bold sandy bluff on the north side, with a clump of firs on the top, near the southern extremity. Stretching about 4 cables S. by W. from this bluff is a broken line of low black rocks. The southern point of the entrance is lower than the northern; it is sandy, and thickly timbered to within a short distance of the beach. Heavy and constant breakers exist on each side of the entrance, narrowing the passage over the bar considerably.

The country behind the shore exhibits hillocks covered with pine, about 4 or 5 miles from the sea, and thickly timbered to their summits.

The north head is the extremity of a peninsula about one mile long and half a mile wide; its sea-shore stretches northward for about $8\frac{1}{2}$ miles to Yaquina point (or head). This shore is a long line of bluff composed of hard sand and soft rock, 100 to 200 feet in height.

The bar of the Yaquina river lies at the south point of the reef, making out about 4 cables southward from the northern head, and is about half a mile wide off the southern point. It is quite narrow, and never free from breakers except at extreme high water, when it appears about half a mile wide. The depth upon it at low water is not more than $9\frac{1}{2}$ feet. A vessel drawing $8\frac{1}{2}$ feet has been taken over at low water, just touching her keel. The water on the bar is reported smoothest in June, July, and August. The current is very strong in the channel between the heads, being estimated at 5 or 6 knots when strongest; a whale-boat cannot pull against it. The summer winds are favourable for both entering and leaving. It is said that S.E. gales do not change the bar, and this appears probable on account of the rocky nature of the north side.

A beacon has been built upon the north head, as a guide in making the entrance, and two beacons are placed on the southern point, W. by S. $\frac{1}{2}$ S. and E. by N. $\frac{1}{2}$ N. of each other, as a range for crossing the bar. They are about 400 yards apart, and form an excellent channel mark. *These particulars are uncertain.*

The approximate geographical position of the entrance of Yaquina river is lat. $44^{\circ} 36'$, long. $124^{\circ} 4'$.

About three-quarters of a mile from the shore, and a quarter of a mile outside the bar, a very dangerous reef of rock extends in a north and south direction, having many dangerous narrow channels across it. It is about $1\frac{1}{4}$ miles long, being composed of a number of rocks, with 6 to 18 feet upon them at low water. Inside of the reef is a channel running nearly north and south, a quarter of a mile wide, and bounded on the eastern or inshore side by the breakers of Yaquina bay. This reef, which forms such a dangerous obstruction to the approaches of the river, serves, however, as a natural breakwater against the westerly seas, which would otherwise render the bar impassable except at high water, and in the smoothest weather. As it is, in heavy weather it is not possible to cross the bar.

There is a dangerous sunken rock, with only 12 feet water over it, lying south-westward of the entrance, and a little over a mile off the shore. From this rock the western range beacon bears N.E. by N. $\frac{1}{4}$ N., and is distant 2 miles. The beacon on the north head bears N. by E. $\frac{1}{4}$ E. distant about 2 miles. These bearings will enable vessels to avoid the shoal (1867).*

The town of Newport is situated on the east side of the north head; and the river has a general course N.E. by E. $\frac{1}{4}$ E. for 12 miles to Elk City, where is the commencement of the military road to the Willamette valley; by the windings of the river, the distance is about 23 miles. A depth of 9 feet can be carried to Elk City, which is the head of tide water. In the first great bend where the river expands there are two small islets. The banks of the river are covered with a thick growth of spruce, pine, and alder. A small steamboat plies occasionally between Elk City and Newport.

Trade was drawn hither by the oyster beds in the river. These have now been exhausted, and a small traffic is maintained in lumber. There is one saw-mill on the river, cutting eight to ten thousand feet per day.

Yaquina Point and Light.—About 8 miles north of the entrance of Yaquina is the headland known as Yaquina point, whose grassy heads, when 2 or 3 miles off the river, show against the bolder headland of cape Foulweather. It is a high, bold point, extending into the sea about half a mile from the beach to the southward. It has on it two conical hills, 300 to 400 feet high, and similar in shape. On its extreme point stands a lighthouse, painted white, from which is exhibited a *fixed white light*, at 161 feet above the sea, visible 19 miles. Its geographical position is lat. $44^{\circ} 30' 30''$, long. $124^{\circ} 5'$.

Yaquina point (or head) serves as a good mark for vessels making the mouth of Yaquina river. It has sometimes been mistaken for cape Foulweather, a headland lying several miles farther to the northward.

Directions.—The following directions for entering Yaquina river have been compiled from the results of the U.S. Coast Survey in 1868:—

Coming from the southward, vessels should first make cape Perpetua, $22\frac{1}{4}$ miles southward of Yaquina river, and, if possible, keep the shore in view up to the entrance.

* We are uncertain whether the beacons above referred to are still in existence.

Cape Perpetua may be recognised by its steep bluffs, thickly wooded, which jut out boldly into the water.

After sighting cape Perpetua steer North a little westerly for the Yaquina. When up with the entrance, bring the beacon on the north head to bear N.N.E., and steer for it $1\frac{1}{2}$ miles, until the outer or western range beacon on the southern side bears N.E., when steer N. $\frac{1}{2}$ W. for about half a mile, until the two beacons come in range. Cross the bar on this range, steering E. by N. $\frac{1}{2}$ N., and continue this course until the beacon on the north head bears N. by W. $\frac{1}{2}$ W., when steer N. by E. $\frac{1}{2}$ E., and round the point at a distance of about 100 yards, until abreast the town of Newport, when anchor in 4 to 5 fathoms water.

Of these courses, the first (N.N.E.) carries you about 2 cables to the northward of the detached rock mentioned above, and you will have not less than 5 fathoms water. The second (N. $\frac{1}{2}$ W.) passes one-eighth of a mile to the eastward of the outer reef, and has nothing less than 4 fathoms water. In crossing the bar the shoalest sounding will be 9 feet, and the passage will be closer to the south breakers than to the north.

In one place the range passes within 60 yards of the edge of the breakers. But, as the depth is uniform here, you may, should you get too close to the south shoals, edge a little over to the northward without fear of finding less water.

Coming from northward vessels should sight Yaquina point (the headland $8\frac{1}{2}$ miles northward of the river), run in to within $1\frac{1}{2}$ miles of it, and steer S.E. by S. $\frac{1}{2}$ S., until in 15 fathoms, and have the beacon on the north head bearing E. $\frac{1}{2}$ S. Now steer for the beacon and continue your course for about $1\frac{1}{2}$ miles until the extreme western point of Yaquina head bears N.N.W., when haul round S.S.E., which course continue for five-eighths of a mile, until the two beacons on the south head come in range; thence proceed as before directed.

Of these courses, the first (E. $\frac{1}{2}$ S. for the north beacon) leads across the north-western end of the outer reef, through a break in its line, and between two rocks with 11 and 12 feet water on them. The course gives both rocks a berth of at least 150 yards, and the depth is not less than 4 fathoms at low water. The second course (S.S.E.) leads up the channel between the outer reef and the bar, in not less than 4 fathoms, and leads to the bar, which may be crossed in the same water and on the same range as in entering from southward. (*U.S.C.S. Coast Pilot*, 1869).

CAPE FOULWEATHER.—Nearly 4 miles northward of Yaquina head commences the long bold face of the headland known as cape Foulweather. From Yaquina head for 4 miles the shore is bordered with low yellow broken cliffs, covered with standing burnt timber. A low flat black rock lies about half a mile off shore, and nearly 8 miles north of Yaquina head, while a large one, the same distance off shore, lies just south of the southern limit of cape Foulweather.

The whole face of the cape is about $5\frac{1}{2}$ miles in extent, N.N.W. and S.S.E., and marked by six or seven sloping grassy heads, reaching from the sea-cliffs to the heavy timber which crowns them, while timber fills the gulches between them. The elevation of the cape is apparently about 800 feet; its westernmost point is about 7 miles northward of Yaquina head. Northward of this part of the cape and behind a black point of the same height, is an opening to a small cove, with yellow cliff and

sand-beach within. This black point is marked by a dense cluster of woods. The northern extremity of the cape is about $9\frac{1}{2}$ miles from Yaquina head and in about lat. $44^{\circ} 40'$, long. $124^{\circ} 4'$; thence northward the shore is comparatively low, and bordered by a sand-beach.

This cape was named by Cook on the day he made the coast, March 6th, 1778. At noon he was in lat. $44^{\circ} 33'$, and the land extended from N.E. $\frac{1}{2}$ N. to S.E. by S., about 8 leagues distant. In this situation he had 78 fathoms over a muddy bottom, and 90 fathoms a league farther off shore. He describes the land of moderate height, diversified by hills and valleys, and principally covered with wood. At the northern extreme the land formed a point, which he named cape Foulweather, from the exceeding bad weather he met with soon after. The expression "northern extreme" has led some geographers to place the cape as high as lat. $45\frac{1}{2}^{\circ}$, but he judged the Foulweather he named to be in $44^{\circ} 55'$. Being here driven off the coast by continued bad weather, he had no opportunity to verify his position, and did not sight the land again until in lat. $47^{\circ} 5'$, thus passing by the entrance to Columbia river. Vancouver places it in lat. $44^{\circ} 49'$. Both of these determinations evidently refer to the northern part of the high land.

Nekas River.—Soon after passing cape Foulweather the shore becomes abrupt and moderately high, with an increased depth of water immediately off it. Four miles south of the Nekas, which is in lat. $44^{\circ} 56'$, it changes to low sand-dunes stretching into a narrow point, forming the south point of the stream, while the north point is a low bluff. The entrance is very narrow and shoal, and inside the river is reported to spread out into a bay of about a mile in extent, and to receive the waters of a stream draining a valley coming from the eastward.

From the Nekas river to cape Lookout the distance is 24 miles, the course N. by W. $\frac{1}{2}$ W., with a shore-line broken by several small streams, amongst which are the Nechesne in lat. $45^{\circ} 2'$, immediately to the southward of Cascade head; the Nes-tuggah in lat. $45^{\circ} 6'$, having a large rock off its mouth; and the Nawuggah in lat. $45^{\circ} 18'$, having on the south side of its entrance a single rocky islet, known as the Haystack hereafter described.

Cascade Head.—In about lat. $45^{\circ} 8'$, long. $124^{\circ} 2'$, a rugged headland, having a sea-face of about one mile in extent, shows prominently when a vessel is close inshore. The south face, overlooking a cove, is without trees and appears very green; the summit of the ridge, which attains a height of about 600 or 700 feet, is covered with spruce trees. About two-thirds of the distance from the southern extremity of the head a well-defined valley makes out upon the sea, and a cascade from a height of 40 or 50 feet falls upon the rocky shore. A short distance northward of this is a smaller cascade, but it is soon shut in. These peculiarities have caused the point to be named Cascade head.

When approached from northward, with the southern extremity of the head bearing S. by E., two rocks appear just touching the south point. The outer one is comparatively low and broad, with two arches through it; the inner arch is the larger, and through it is seen the beach beyond. As seen from southward this head is

particularly noticeable by having two or three large spruce trees standing alone and above the surface of the second higher seaward slope, at an elevation of perhaps 500 feet.

A small inlet lies a few hundred yards southward of the head, from which extend out three low black rocks. The width of this cove is about half a mile, and the depth the same; at its head is the opening of a small valley, through which runs a stream with a shanty near its bank. South of this, again, for 4 or 5 miles, the immediate shore is low and sandy with signs of a lagoon or marsh inside; perhaps the waters of the Nekas.

Northward of Cascade head the shore retreats somewhat, and a steep-sided timbered valley opens upon the sandy beach. From the mouth of the valley northward there are undulating hillocks pleasantly green from summit to beach, which continue to the opening of a stream which is about 9 miles north of the south part of Cascade head. The outermost point of the sand-beach on the northern side of the entrance has a high rock off it.

Haystack Rock.—About 12 miles northward from Cascade head is a high rocky islet of regular shape, named the Haystack. It appears to be nearly half a mile off the point, and possibly has a passage around it; its height is estimated to be 807 feet, and it is approximately in lat. $45^{\circ} 18'$, off the Nawuggah river. Half a mile north-eastward of it is Haystack point, a low cavern-worn cliff of sandstone, with its summit covered with grass, and its inshore slope with timber. About half or three-quarters of a mile from this cliff a small stream is seen cutting through the sand-beach at low water.

Cape Lookout.—This cape is approximately in lat. $45^{\circ} 30'$, long. 124° , and is distant about 18 miles northward from Cascade head. It projects somewhat sharply into the sea for half a mile, and as seen from the south the top is tolerably flat and regular; its highest part is considered to attain an elevation of 3000 feet. The face directly toward the ocean is perpendicular and high; toward the south it is destitute of trees. About 8 miles southward of it the Haystack rock, off the Nawuggah, may be observed, standing well out from the low sand-beach behind it. No rocks lie off this cape, but one appears very close inshore, about a mile northward of it.

The soundings from cape Foulweather to cape Lookout show from 18 to 81 fathoms of water at the distance of a mile from the shore, increasing from 18 fathoms north of lat. 45° .

Cape Meares.—Two or three miles after leaving cape Lookout the land falls to a low sand-beach, behind which is a long lagoon, called the Nat-a-hats, coming from the south-eastward, stretching northward, and having an opening under the south head of the well marked point named cape Meares. This cape is the termination of a spur or ridge running from the south-eastward, presenting an abrupt front to the ocean for about 2 miles, and being part of the western boundary of Tillamook bay.

Cape Meares (or La Mea) is estimated to be about 1200 feet high; its face is broken and bluff, increasing in elevation as it retreats from the shore; it is covered with spruce. Several arched rocks lie off the cape by which it may readily be known. Approached from southward four large rocks show off the cape, and two of them have

arches through them. These rocks are about 150 feet high, except the outermost, which is comparatively small. Four rocks are laid down off the south-west face of this cape on the Coast Survey reconnaissance of 1850, and one on the north. Three large rocks and one small one are laid down off the south-west face in the original sheets of the reconnaissance of 1858, the most distant being one mile from shore, with several small ones between them and the shore, and two or three others off the north-west face.

In 1775 Heceta placed La Mesa (the Table) in latitude $45^{\circ} 28'$ —a flat-topped mountain, seen at a great distance.

In July 1788, Meares, in the *Felice*, after passing cape Falcon (False Tillamook), says—"The distant southerly headland we called cape Lookout. This cape is very high and bluff, and terminates abruptly in the sea. At about the distance of 2 miles from it there rose three large rocks, which are very remarkable for the great resemblance they bear each other. The middle one has an archway, perforated, as it were, in its centre, through which we plainly discovered the distant sea. They more particularly attracted our notice as we had not observed between King George sound and this place any rocks so conspicuously situated near the land; their distance from each other might be a quarter of a mile, and we gave them the name of the Three Brothers."

In 1792 Vancouver described it as a small projecting point, yet remarkable for the four rocks which lie off it, one of which is perforated as described by Meares. He places it in lat. $45^{\circ} 82'$. (*U.S.C.S. Coast Pilot*, 1869).

TILLAMOOK BAY.—The entrance of this bay is about 4 miles northward of cape Meares, and 28 miles southward of Tillamook head. From cape Meares the land falls to a low narrow ridge of sand-dunes running N.W. by W. and covered with spruce for 8 miles; then with grass and bushes for another mile to the entrance to Tillamook bay. The hillocks of this peninsula appear to be only 40 or 50 feet high. The north side of the entrance to this bay rises abruptly to wooded hills, 1200 feet high. Just within the entrance, on the northern side, is a remarkable hill, known as Green hill; it has a bright green appearance, is destitute of trees, and is about 420 feet in height. Green hill is a prominent feature in recognising the entrance and in crossing the bar; the approximate geographical position of its summit is lat. $45^{\circ} 82'$, long. 124° .

About $1\frac{1}{4}$ miles north of the bar, is a double-headed rock, connected with the beach at low water, with no rocky ground near. These rocks are gray, about 80 feet high, and stand out conspicuously against the bright sand-beach. The southern rock has an arch through it, when seen from the southward.

The entrance to Tillamook bay is 8 cables wide, but the channel between the 12-foot curves is only two-thirds of a cable wide. The narrowest part, with a depth of 4 to 8 fathoms, is close to the foot of Green hill, and the breakers always show the south side of the channel. The two points of the entrance are N. $\frac{1}{4}$ W. and S. $\frac{1}{4}$ E. of each other.

The bar in April 1807 was situated S.W. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles from the foot of Green hill, and three-quarters of a mile S.W. by S. $\frac{1}{4}$ S. from the nearest part of the north head. The channel was narrow but quite straight, and a depth of 15 feet could

be carried across the bar at low water. Outside the bar the depth increased rapidly to 5 fathoms in one-eighth of a mile and one mile outside the bar the depth was 19 fathoms.

In entering bring the highest part of Green hill to bear N.E. by E., and run for it over the bar; after crossing which, gradually haul for the lower part of the hill. When its extremity bears N.N.W. steer for the eastern shore of the south point, running close to it in 26 feet water, with a hard fine sand-bar, with only 4 feet water upon it, a cable from the shore. (1867).

Inside the entrance of Tillamook bay its general direction is S.E. by S. $\frac{1}{4}$ S. for $2\frac{1}{2}$ miles, then E. $\frac{1}{4}$ S. for $2\frac{1}{2}$ miles. It rapidly expands as it stretches southward, and there is a small shallow cove lying to the northward and eastward of the parallel of Green hill. The bay is mostly occupied by flats that are bare at low water. The principal channel through it runs from the inside of the south point of the entrance towards the south-east part of the bay; and after reaching the middle of the bay, just south of Mematnet head, it runs parallel with the eastern shore at an average distance of half a mile, until abreast Shell point, when it runs southward a short distance and abruptly turns to the S.E., running close alongshore. It is said that vessels drawing 8 or 10 feet water can go up the slue about 6 miles above the head of the bay at high water. Up to 1867 there had been three vessels built here, the largest about 40 tons burden. One of these was engaged, in 1867, in making occasional trips to Portland for flour and other supplies. The exports consist of a little butter and a few hides. The whole imports and exports do not exceed 50 tons yearly. There is a considerable amount of timber, consisting of spruce, fir, hemlock and cedar, adjacent to the bay, but as yet nothing has been done to develop its value.

Nehalem River.—About $1\frac{1}{4}$ miles north of Tillamook bar stands the double-headed rocks described above; thence the coast runs 10 or 11 miles nearly straight to cape Falcon, receiving a considerable stream called the Nehalem river.

The mouth of this river is in about lat. $45^{\circ} 41\frac{1}{4}'$, and for 8 miles from its entrance it lies parallel and close under the west side of a bluff covered with trees and running nearly north and south. Around the north-west point of the bluff the stream comes sharply from the eastward and is about three-quarters of a mile in width at high water, with 18 feet depth at that stage of tide. Between the river and the sea lies a long narrow strip of sand-dunes, about 25 feet high, its extremity forming the north point of the river's entrance. Abreast this point the river contracts in width to 200 yards, with very little depth of water, while upon the bar the sea breaks almost unceasingly.

Inside and abreast the southernmost sand-dune there is as much as 80 feet water, with a rocky ledge on the eastern side. Within the entrance the Nehalem spreads into a lagoon 4 miles wide with a length of 8 miles, where it decreases in width; its general direction being N.N.E. The hills behind the Nehalem appear cut by many valleys. The tongue forming the ocean boundary to the lagoon runs N.N.W. to a double-headed peak, about 1200 feet high, about three-quarters of a mile south of cape Falcon. This peak is covered with grass to the summit, with a few burnt trees in the gorges: it is known by the Indian name of Ne-ah-kah-nio. At the base, on the south side of the mountains, is a large house.

Clarke, when about 5 miles south of Tillamook head, says that "the principal town of the Killamucks is situated 20 miles lower (south) at the entrance to a creek called Nielce, expanding into a bay, which he named Killamucks bay. Upon this bay were several Killamuck towns. Killamuck river is at the head of the bay, 100 yards wide, and very rapid; but having no perpendicular fall, is a great avenue for trade. There are two small villages of Killamucks settled above its mouth, and the whole trading portion of the tribe ascend it till by a short portage they carry their canoes to the Columbia valley, and descend the Multnomah to Wappatoo island." This information he obtained from Indians and traders. On this short expedition he made all his distances from cape Hancock and point Adams too great, and reducing the fore-mentioned 20 miles by the proper proportion, it would give us 13 miles as about the position of the Nehalem. His name seems to agree with this, but the description applies to what is generally known as Tillamook bay.

It was in this vicinity that Meares stood in for an anchorage, (July 1788), until he found bottom in 10 fathoms, but hauled out again and named the place Quicksand bay, and the adjoining headland north, cape Grenville.

Cape Falcon or False Tillamook.—The northern part of this headland lies in lat. $45^{\circ} 47'$, long. $128^{\circ} 58'$. Its sea-face falls precipitously to the ocean, and its elevation is about 720 feet. Off the cape are several rocks, one of which, 50 feet high, lies three-quarters of a mile off the nearest land; it is known as Falcon or Last rock. About 2 miles north of the cape and nearly a mile off shore, is another isolated rock, 113 feet high. Seen from southward the top appears irregular and the hills inshore fall away. Like some other headlands in this district, the southern face of the cape is destitute of trees, but covered with a thick growth of grass, bushes, and fern. Two miles south of it is a stretch of sand-beach and sand-dunes behind which is the Nehalem river.

From cape Lookout to this headland a depth of 20 fathoms may generally be found at a mile from shore; but, as upon the whole coast, a heavy regular swell always rolls in from the west.

TILLAMOOK HEAD.—This prominent cape, in lat. $45^{\circ} 58'$, is 12 miles N.N.W. from cape Falcon, and 19 miles S.E. by S. $\frac{1}{4}$ S. from cape Hancock (or Disappointment). The coast from cape Falcon curves slightly to the eastward; it is bold and rugged, skirted by many high rocky islets and reefs, and in several places bordered by a low sand-beach at the base of the cliffs. Two miles south of the head is a creek, 80 yards wide at its mouth, named Elk; northward of which are some rocks off points of the coast. One of these, known as Arch rock, is 140 feet high and lies a quarter of a mile off a point in lat. $45^{\circ} 55'$. From the south bar of Columbia river the summit of Tillamook head appears flat for some distance back; it has an estimated height of 1200 feet. Off the face of the cape, which is very steep, lie several rocky islets; one of them, named Tillamook rock, 115 feet high, is high and rugged, and stands out about a mile from the south-west face. Around it the water is believed to be deep, a steamer having been seen to approach almost upon it in a thick fog; but inside of it lie several high rocks. The rocks off the head are a resort of thousands of seals.*

* It is intended to erect a lighthouse on Tillamook head.

About midway between Tillamook rock and Tillamook head is a rock, just above water. The least water close to either of these rocks is not less than 15 fathoms. A strong current, generally to the northward, runs between them. Vessels should not approach the shore between Tillamook and False Tillamook inside of a line joining Tillamook rock and Last or Falcon rock.

Tillamook head is a good mark for making the mouth of Columbia river, no such high headland occurring on the coast northward of it for over 70 miles, and before being up with it the moderately high land of cape Disappointment is seen and made as two islands. The face of the cape is much broken, and formed principally of yellow clay, presenting a bright appearance in the sunlight. It has been said that at 1200 feet above the ocean occurs a stratum of white earth, used by the Indians as paint; and that the hill-sides slip away in masses of 50 to 100 acres at a time.

The coast from point Orford to Tillamook head is well diversified by high hills and valleys, presenting a country well watered by numerous small streams emptying into the ocean. It is densely covered with various woods, and for a few miles inland looks favourable from the deck of a vessel. At some distance in the interior are ranges of mountains, the general direction of which appears to be parallel with the coast-line, which attains its greatest elevation and compactness between cape Falcon and Tillamook head, after which a sudden and marked change takes place, and a stretch of low sandy coast commences and runs for nearly 100 miles northward, only broken by cape Disappointment, the north point of Columbia river.

The coast at 2 miles northward of Tillamook head is followed by and consists of a peculiar line of low sandy ridges, running parallel to the beach towards point Adams, (the south point of entrance to Columbia river), and appearing like huge sand waves covered with grass and fern. Between some of them run small creeks, whilst the country behind is low, swampy, and covered with wood and an almost impenetrable undergrowth. About 8 miles north of the head is a small stream known as the Nekanakum creek.

Point Adams and Light.—Point Adams is low and sandy, covered with bushes and trees to the line of sand-beach and low dunes; and although it is reported to have washed away over half a mile since 1841, the surveyors were able to detect only comparatively small changes since the survey of Broughton in 1792.

On a low ridge on the western side of point Adams is a square tower, from which is exhibited a *flashing* light, showing alternate *red* and *white* flashes at intervals of 10 seconds. The light is 99 feet above the sea and visible 16 miles. A fog-whistle, situated 190 feet from the lighthouse, is sounded during fog as follows—blast of 7 seconds; interval of 14 seconds; blast of 4 seconds; then an interval of 35 seconds. The geographical position of the lighthouse is lat. $40^{\circ} 7'$, long. $128^{\circ} 57' 15''$.

From this lighthouse Tillamook head bears S. by E. $\frac{1}{4}$ E. distant 16 miles; and cape Disappointment light N.W. $\frac{1}{4}$ W. distant nearly 6 miles.

CAPE DISAPPOINTMENT and Light.—This cape is the only headland from Tillamook head to lat. $47^{\circ} 20'$ that breaks the low line of shore. It presents a geological formation not before met with on the seaboard, being composed of horizontal columnar basalt, rising to an elevation of 287 feet, disposed in a succession of huge round hills,

broken on the sea front by short strips of sand-beach, and covering an irregular area of about 8 miles by one mile. The sea-faces of all the hills are destitute of trees, but covered with grass, and bushes, and have an excellent though thin soil.

As seen from southward, when off Tillamook head, cape Disappointment is made as two round-topped islands; approached from north-westward it rises in a similar manner; from the westward and south-westward it appears projected upon the mountains inland, but the slightest haziness in the atmosphere brings it out in sharp relief. The Indian name for cape Disappointment is Káh-eese.

When the evening fogs from the northern bays do not cover the cape, a dense fog has occasionally been observed rolling down the river about sunrise, enveloping everything below the top of the cape which consequently looked like an island of less than 100 yards in extent, and surrounded by the river fog. The evening fogs are so regular that the surveyors state they were 85 days on the cape before obtaining a single night's observations.

A lighthouse has been erected on Hancock point, the southern extremity of cape Disappointment. The tower is whitewashed, and being 40 feet in height and projected against a dark green background, shows well in daylight. It exhibits a *fixed white light*, at 230 feet above the sea, visible about 22 miles. Its geographical position is lat. $46^{\circ} 12' 20''$, long. $124^{\circ} 2' 20''$.

A powerful *fog-bell*, placed on the bluff in advance of the light-tower, is sounded during foggy weather. The machinery is on a level with the ground, in a frame building, painted white.

From cape Disappointment point Grenville bears N.W. by N. $\frac{1}{4}$ N., distant 62 miles; Destruction island N.W. by N., 84 miles; and Flattery rocks N.W. $\frac{3}{4}$ N., 118 miles.

COLUMBIA RIVER.—The great valley of Columbia river is by far the most important and interesting part of Oregon, not only on account of the variety of soil, productions, and climate, but also from its being the great and only line of communication between the sea coast and the interior. The river is estimated to be 750 miles long, and is navigable from its entrance, a distance of about 100 miles, as far as the Cascades, by vessels drawing over 12 feet of water. Although it possesses at all times a good depth of water, it is difficult and dangerous to enter.

The channels of the entrance to the river are subject to changes in width, depth and direction, but the buoys (hereafter described) are located to correspond therewith. Of late years the South channel has been the wider and deeper, occasionally reaching as much as 27 feet at low water, whilst the North channel has been decreasing in width and depth; it now carries about 21 feet. Range beacons for leading in are erected on Sand island, and are shifted as required to meet any change of the banks. *No vessel should cross the bar without a pilot on board.*

It is said a vessel drawing 22 feet can safely cross the bar of the Columbia. It is not safe beyond that depth in rough weather, though vessels drawing 24 feet have crossed, and can cross safely at high tide in calm weather. When the Willamette river is at its lowest stage, vessels can safely load to $14\frac{1}{2}$ feet. At Ranier they load to $17\frac{1}{2}$ feet, and at Astoria to 22 feet. The depth of the water on the bars is influenced very much by the winds. Thus a ship going down with the wind N.E. has touched at

15 feet, whereas, a week afterwards, after a S.W. wind has been blowing, a vessel passed up freely, drawing 16 feet 8 inches.

The entrance to the Columbia, the great river of the Pacific coast, is 5 miles wide between the nearest parts of cape Disappointment and point Adams, bearing S. $58\frac{1}{4}^{\circ}$ E., and N. $58\frac{1}{4}^{\circ}$ W. from each other; but the passage is obstructed by extensive shifting shoals that lie 2 or 3 miles outside of the line joining the points. The South channel, which is nearly always used, is one mile wide, and the least water on its bar is 24 feet at low water. The North channel, between the North breakers and Middle sands, is more contracted than the South channel and as already stated carries only 21 feet water.

The mail and coasting steamers enter the South channel, close to the beach south of point Adams; but, with a heavy swell from westward, they roll very much after rounding the point. In heavy weather some of them prefer entering the North channel, although it gives a detour of some miles. Sailing vessels cannot beat into the South channel against the summer winds blowing from north-westward, but almost invariably come out through it. The heavily laden vessels of the Hudson Bay Company have always used the North channel. The buoys marking the channels are described below.

During heavy weather, and especially in winter, the sea breaks with terrific fury from north-west of cape Disappointment well to the southward of point Adams.

When off the entrance in fine clear weather, the beautiful snow peak of mount St. Helens shows over the lowest part of the land inside, and apparently in the middle of the river valley. It is very regular in outline, and presents a pyramidal appearance, having a base equal to either side. It is more than 75 miles eastward from the entrance to the river, and attains an estimated elevation of 18,500 feet. It is volcanic, and occasionally discharges volumes of smoke. On the 28rd of November, 1842, during an eruption, the ashes from it fell over the Dalles of the Columbia like a light fall of snow. On the 18th of November, 1848, mounts St. Helens and Rainier were both active.

Pilots.—It is at all times considered advisable, when up with the bar, to wait for a pilot. The pilot station is at Astoria or fort George, situated about 12 miles inside the bar. Vessels arriving off the bar are signalled from the lighthouse on cape Disappointment to the signal at the pilot station, when a pilot is sent out in a steamer, the vessel taking her pilot and steamer to tow her in at the same time.

The pilots are appointed by the Government, and under its control. There are two classes of pilots—the *Sea* pilots, taking charge from sea to Astoria, more especially for the bar navigation; and *River* pilots, from Astoria to Portland, and *vice versa*. A tug-boat is always at hand to tow vessels in and out, so that the chances of detention are very few. These tug-boats or steamers are private property, but tariff of rates for towing is fixed by the Government.

Buoys.—An automatic signal-buoy (whistle), white and black in vertical stripes, is moored off the entrance to the South channel, in $14\frac{1}{2}$ fathoms water. From it cape Disappointment lighthouse bears N. by W. $\frac{1}{2}$ W., 7 $\frac{1}{2}$ miles, and point Adams lighthouse N.E. by N., 4 $\frac{1}{2}$ miles. Distant $1\frac{1}{2}$ miles N. $\frac{1}{2}$ E. from this signal-buoy is the

Outer Bar buoy of the South channel; it is painted black and white in vertical stripes, and moored in 12 fathoms. No. 1, black, buoy lies at the south-east extremity of the Middle sand. No. 2, red, on a shoal between Middle sand and Clatsop spit. No. 4, red, at the northern extremity of Clatsop spit.

The Outer Bar buoy of the North channel is moored in 9 fathoms, S.W. by W. $8\frac{1}{2}$ miles from cape Disappointment lighthouse; it is painted black and white in vertical stripes. Another buoy, similarly coloured, lies 2 miles E.N.E. from the Outer Bar buoy, in $4\frac{1}{2}$ fathoms. No. 1, black, lies in $4\frac{1}{2}$ fathoms, 7 cables South from the lighthouse on cape Disappointment. Then follow,—red buoy, No. 2, on the east side; and black buoys, Nos. 3 and 5, on the north-west side of the channel. (1879).

The buoys are altered in position as required to meet the changes that take place in the channels. The range beacons on Sand island are also shifted for the same reason.

Tidal Current.—Off Sandy island, in the South channel, the strength of the ebb current was measured in 1851, and found to be nearly $5\frac{1}{2}$ miles per hour. The observations made by the Coast Survey in 1868, however, show a maximum velocity of only $3\cdot4$ miles in the same position. These observations show, first, that there is no slack-water at the change of tides from flood to ebb; secondly, that off the entrance to the North channel the maximum velocity of the flood is 2 miles per hour, and the set E.S.E.; the maximum velocity of the ebb is $2\cdot3$ miles, and the set S.W. by S. $\frac{1}{4}$ S., almost in the direction of the channel. In the North channel, between the Middle sands and the S.W. point of the North breakers, the velocity of the flood was $2\cdot5$ miles, and its set E. by S., or nearly across the channel. The velocity of the ebb was $2\cdot7$ miles, and its set S.W. $\frac{1}{4}$ W., directly down the channel. At the junction of the North and South channels, one mile east of Sand island, the flood was E. by S. $\frac{1}{4}$ S., $1\frac{1}{2}$ miles per hour; and the ebb, W. $\frac{1}{4}$ N. 4 miles per hour.

Off the South channel entrance, $1\frac{1}{2}$ miles south-east of the south end of the Middle sands, the ebb attains a velocity of 2 miles per hour, with a set at its maximum, S. $\frac{1}{4}$ W. The flood sets E.S.E., when it attains its greatest velocity, which is $1\cdot8$ miles. Off the north-west end of Clatsop spit, flood, at its maximum, sets E. by N. $\frac{1}{4}$ N., at the rate of $1\cdot4$ miles; and the ebb, S.W. $\frac{1}{4}$ W., 3 miles per hour. In mid-channel, south-east of the eastern end of Sand island, the ebb attains a velocity of $3\cdot4$ miles, and sets W. by S.; while the flood at its maximum sets E. $\frac{1}{4}$ N., with a velocity of $1\cdot9$ miles.

Tides.—At Astoria the corrected establishment is 12h. 42m. The mean rise and fall of tides is $6\cdot1$ feet, of spring tides $7\cdot4$ feet, and of neap tides $4\cdot6$ feet.

The tide makes 40 minutes earlier at cape Disappointment than at Astoria.

Sand Island.—This island, the first met with after passing the bar, is about $1\frac{1}{2}$ miles long, and is separated at high water into two parts. These two parts lie E.N.E. and W.S.W. of each other, and are about 480 yards apart. They consist of loose sand raised a few feet above the river, and covered with trees, drift logs, &c. From the western end of Sand island a sand-bar, three-quarters of a mile long and bare at low water, extends in a W.S.W. direction; and from the end of this bare spit the Great Middle sands make out, separating the North and South channels.

Baker Bay lies between cape Disappointment and Chinook point. It runs $2\frac{1}{4}$ miles northward of the cape, and receives the waters of the small streams which head towards Shoalwater bay, and is connected with them by a small portage. The western and largest stream is the Wal-la-khat; the eastern, half-way between the cape and Chinook point, is the Wap-pa-loo-chee.

Chinook Point, on the northern side of the river, lies N. by E. $2\frac{1}{4}$ miles from point Adams, and E. $\frac{1}{4}$ N. $4\frac{1}{2}$ miles from cape Disappointment. It is a long low strip of sand at the base of high wooded hills. One of the hills, known as Scarborough, is readily recognised by a great part of its southern slope being destitute of trees and covered with fern; no other hill near this vicinity possesses this peculiar feature.

A number of fishing and Indian huts are situated upon the Chinook beach, the people being engaged in catching and curing salmon, with which the waters abound. The mode of catching them is by means of nets. The fish are the largest on the coast, often exceeding eighty pounds in weight. Fish weighing between fifty and sixty pounds are caught upon the beach at the sea-base of cape Disappointment. They commence to run about the end of May, and become remarkably plentiful by the third week in June.

Chinook point was the special location of the once powerful tribe of Chinook Indians, and here the celebrated one-eyed chief, Concomly, held sway. In 1869 the tribe had dwindled down to less than a hundred persons who were in a miserably poor and demoralised condition.

The point was named Village point by Broughton, in 1792. In 1889 it was called Chenoke point by Belcher. The Indian name is Nose-to-ilse.

Point Ellice, on the northern side of the river, is $2\frac{1}{4}$ miles eastward of Chinook point; the sand-beach between the two is in some places nearly a mile wide, running at the base of the hills, and surrounding a large lagoon near Chinook. From point Adams it bears N.E., distant $4\frac{1}{2}$ miles.

Behind point Ellice rise two hills, the southern of which is sometimes used as a range with point Adams for denoting the entrance to the South channel, but of course the relative positions vary with every change of the bar.

It was called Ellis point by Belcher in 1889, and point Ellice by the United States exploring expedition in 1841. The Indian name is No-wehtl-kai-ilse.

Young Bay lies between the eastern part of Clatsop beach (called Tansey point) and Young point. Into it empty Young river, discovered, and named by Broughton; Lewis and Clarke rivers, examined by them in 1805; and one or two small streams and slues.

Smith Point, on the southern side of the river, is a prominent point about $4\frac{1}{4}$ miles eastward of point Adams. Immediately behind it the land is high and densely wooded; and around its southern face opens Young river.

Smith point was named point George by Broughton in 1792; George point by Belcher in 1889; Young point by the United States exploring expedition in 1841; Smith point by the Coast Survey, in 1852; but it is, we believe, generally known as Smith point.

Tongue Point, on the southern side of the river, bears E.N.E., $8\frac{1}{4}$ miles from point

Adams. It is a high bluff covered with trees, and connected with the main by a moderately low narrow strip of land. As first made, off the entrance, it appears like a low wooded island. Close to it runs the Woody Island channel. The Indian name of Tongue point is Soo-kum-its-é-ak.

Astoria.—On the northern side of the promontory which terminates in Smith point is situated the harbour and town of Astoria, now a thriving commercial place; it is distant about 6 miles from point Adams. A custom-house is located here, and it is connected with Salem, the capital of the State, by a military road. Vessels bound up the river here exchange the "bar-pilot" for a "river-pilot."

Portuguese Point is on the north side of the river, N.N.W. $8\frac{1}{2}$ miles from Tongue point, and N.E. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from point Ellice. On the north-east side of Portuguese point is Gray bay.

Portuguese point was named cape Broughton by Belcher in 1839, but was called Gray point by the United States exploring expedition.

The head between point Ellice and cape Broughton was named Chatham head in 1880.

From the entrance to the mouth of the Cowlitz river the general course of the Columbia is E. by N., and the distance in a straight line 46 miles from the bar, and by the windings of the river about 52 miles. The Cowlitz runs N.N.W. for 24 miles; thence N.E. to its headwaters in the Cascades; it is navigated by canoes about 28 miles to the Cowlitz landing. The stream is very rapid, and boats have to be poled the greater part of the way; at high stages of the water they are pulled up by hauling upon the bushes growing upon its banks. At the Cowlitz landing travellers take mules or horses through to Puget sound, a trip of 52 miles. On the west bank of the Cowlitz, 5 miles above its mouth, are a few small houses, locally known as the town of Monticello. On the south bank of the Columbia, opposite the Cowlitz, is another small settlement, called Rainier.

From the Cowlitz the next course of the Columbia is S.E. by S. for 29 miles to the mouth of Willamette river. About 16 miles above the Cowlitz the Warrior branch or slough of the river makes in from the west side and runs around Multnomah island, coming into the Willamette 2 miles above its mouth. The Willamette continues the same general course of the Columbia for 16 miles to the falls, where is situated the town of "Oregon City," destined to become a place of importance, on account of the extensive water-power; the river there falling perpendicularly 88 or 40 feet. Six miles lower down on the Willamette is the rapidly improving town of Portland, situated at the head of ship navigation, with a population of nearly 5000. The valley of the Willamette is well settled, contains several thriving towns, and is remarkably productive.

The Willamette takes its rise on the western slope of the Cascade range, in about lat. $48\frac{1}{2}^{\circ}$, between the snow peaks of mount Jefferson and mount Laughlin; then runs westward to within 50 miles of the coast, and nearly in the latitude of cape Perpetua, turning sharply to the northward, and very slowly leaving the coast.

From the mouth of the Willamette the general course of the Columbia to fort Walla-Walla is N.E. by E. $\frac{1}{2}$ E., 170 miles.

Five miles above the Willamette, on the north side, is the military post of fort

Vancouver, which, with the town of Vancouver, covers part of the grounds formerly occupied by the Hudson Bay Company as a mercantile station, but then designated as fort Vancouver.

About 80 miles farther up the river we reach the foot of the Cascades, which are a series of rapids 4 miles long, where the river bursts through the eastern part of the Cascade range of mountains, the basaltic walls of which rise precipitously over 8000 feet on either side, presenting a magnificent sight. Below the rapids the current rushes by with great velocity and depth, but small steamboats ply regularly from Portland and Vancouver to the foot of the rapids; thence passengers are carried by stages to the head, where one or two fine steamboats convey them 50 miles to the Dalles. The Hudson Bay Company carried their large trading boats up the rapids by a system called cordelling. Steamboats have gone up 1 or 2 miles, and, in one instance, a brig, with every sail set and a moderate gale astern, was carried safely to the foot of the railroad, which runs from the head to within 1½ miles of the lower end. At each extremity of the rapids are small military

The snow peaks of the volcanic mount St. Helens and mount Hood lie exactly in line with the Cascades, the former N.W. ¼ N., 85 miles distant; the latter S.E. ¼ S., 28 miles distant.

Mount Hood is an extinct volcano covered with cellular lava, and, according to Dana, is between 15,000 and 16,000 feet high. According to other authorities, it attains an elevation of 18,816 feet.

At the Dalles the river is contracted between narrow perpendicular walls, and during freshets rises 100 feet above its ordinary level.

East of the Cascades the forests cease, and above the Dalles stands the only tree in a stretch of 60 miles beyond Walla-Walla, where the river makes a great bend to the northward, in the direction of its source at the base of the Rocky mountains.

On the lower parts of the Columbia and Willamette many saw-mills have been erected since the gold discovery in California, and a large trade is carried on in lumber. Between San Francisco and Portland a very large and increasing general trade exists.

Commander Wilkes, U.S. Navy, makes the following general observations on Columbia river—"The principal dangers in the entrance are the cross tides, their velocity, and the influence of an under-current, together with the heavy swell. These become greater from the distance of the leading marks for the channel, and their indistinctness when the weather will permit entrance. It is necessary to use them, in consequence of the compass bearings being of little or no use.*

It is safest to enter the river on the ebb-tide, with the usual north-west wind, which

* After alluding to the loss of his consort, the *Peacock*, on the bar, he says—"The cross-tides change every half hour, and are at times so rapid, that it is impossible to steer a ship by her compass, or maintain her position; and no sailing directions can possibly embrace the various effects produced upon them by a vessel. A singular fact in illustration of this remark is that the safest time to cross the bar is when both the tide and wind are adverse; and this is the only port, within my knowledge, where this is the case. During the summer, haze and fog occur almost every day in the afternoon."

sets in about 10 or 11h. A.M., during the summer months. The entrance should never be attempted with a flood-tide and N.W. wind, unless the Clatsop channel be followed, and the sea is smooth.

When passing cape Disappointment, care must be taken not to be becalmed by it; if this should happen, the only resource is to down anchor at once, and wait a favourable tide. The current will be found very strong; it sometimes runs from 5 to 6 knots an hour—a perfect mill-race—and no boat can make way against it when at its strength.

When entering the river, the following precautions should be attended to:—

1. The entrance should never be attempted when the passage between the north and south spits is not well defined by breakers; it is equally dangerous, whether it be concealed by the sea's breaking all the way across, or so smooth as not to show any break.

2. The wind generally fails, or falls light, in the passage between the north and south spits, if it blows but a moderate breeze; and leaves a vessel at the mercy of a strong tide and heavy swell.

3. The best time to enter and depart, is after ebb, and before quarter flood; the tide then runs direct through the channels, and is confined to them. With the prevailing westerly winds, for those intending to take the north channel, the best time to enter is after half-ebb, though the wind may be scant; yet the ebb-tide, acting on the lee bow, will enable the vessel to keep to windward, and avoid the spits on the middle sands."

SHOALWATER BAY.—The bold cliffs of cape Disappointment*, after extending about 3 miles northward, change suddenly to a low broad sandy beach, running N. by W. $\frac{1}{4}$ W., 18 miles, in nearly a straight line to the southern point of the entrance to Shoalwater bay. At $1\frac{1}{4}$ miles behind this beach lies the southern arm of the bay. Its waters reach within 1 or 2 miles of the north side of the cape, and the portage from them to the Wappalooche, emptying into Baker bay (Columbia river) is said to be about a mile long, and is always used by the Indians and settlers. The peninsula thus formed is covered with trees and a dense undergrowth of bushes. Within half a mile of its extremity it becomes very low and sandy, and has a covering of coarse grass, but no trees. This point is known as Leadbetter point. The Indian designation is Chik-lis-ilh. Its approximate geographical position is lat. $46^{\circ} 36' 45''$, long. $124^{\circ} 0' 45''$.

From Leadbetter point to cape Shoalwater (the north point of entrance to Shoalwater bay) the bearing and distance are N.W. by N. $\frac{3}{4}$ N., $5\frac{1}{4}$ miles. Half a mile of this point is low, sandy, and destitute of trees, but some tolerably high land covered

* The coast from cape Disappointment northward to Juan de Fuca strait is rocky, much broken, and affords no harbours, except to very small vessels; it must, therefore, be considered as extremely dangerous, and particularly on account of its outlying rocks. The soundings, however, serve as a sure indication by which danger may be avoided, and safety can always be insured by not approaching the land into less than 70 fathoms. The bottom is believed to be regular, and to shelve almost gradually, until the depth of 90 fathoms is reached; but a short distance beyond that depth, and at about 15 miles from the land, the bank suddenly falls off, and no bottom is obtained with a line 200 or 250 fathoms long.

with wood rises immediately behind it, being the only elevated ground between cape Disappointment and point Grenville that approaches the shore-line. On account of this formation of the point it has been said that the entrance resembles that of Columbia river. The isolated position of cape Disappointment and the seaward face of its bold cliffs without trees form a peculiar feature. This, with Scarborough hill, partly bare, lying 5 or 6 miles eastward of it, the high mountains inland, and in clear weather the beautiful snow-peak of mount St. Helens, have no counterparts at cape Shoalwater, and should remove all doubt in regard to general resemblance.

Light.—The lighthouse upon cape Shoalwater (Toke point) is 85 feet high, and shows a *fixed* light (*flashing every two minutes*), at 85 feet above the sea, visible about 14 miles. Its geographical position is lat. $46^{\circ} 48' 4''$, long. $121^{\circ} 4' 28''$.

The navigation of Shoalwater bay is *too intricate to be attempted by strangers without a pilot*, and it is believed that the channels are subject to great and frequent changes. The bay is seldom entered even by coasting vessels. In less heavy weather than would cause the sea to break on the Columbia river bars, it breaks here with fury quite across the entrance.

Four miles off the entrance a depth of 10 fathoms is found, and when well off shore a high double peaked mountain shows to the eastward, well inland. Meares noticed it, and placed it in latitude $46^{\circ} 30'$, quite close to the coast, designating it as Saddle mountain, a name it still retains, although one of the same name is found S.E. of point Adams.

In 1855 there were two channels, denominated from their position the *North* and *South* channels, with a large shoal called the *Middle sands* lying between them, and partly outside of the line joining the two points.

The bar at the South channel had 4 fathoms water upon it, was a mile wide, and was situated 2 miles off the beach south of Leadbetter point, with the northernmost trees bearing N.E. by E. Coasters do not enter this channel except with a southerly wind, and always pick out the channel from aloft. In summer they have a leading wind out, and start on the first of the ebb.

The bar at the North channel had about $8\frac{1}{2}$ fathoms upon it in 1855, and bore S.W. by S. $\frac{1}{4}$ S., 3 miles from the southern extremity of cape Shoalwater (Toke point). It was about a mile in extent within the 8-fathom line, and bore N.W. by N. $\frac{1}{4}$ N., distant 5 miles, from the south bar.

There are buoys to mark the channels, but their positions are shifted to suit the changes which are constantly taking place in the sand-bars at the entrance of the bay.

The Middle sands lie between the two channels. The southern tail is S.W. $1\frac{1}{4}$ miles from Leadbetter point, runs N.W. by N. $\frac{1}{4}$ N. for $2\frac{1}{2}$ miles, then N.N.E. $2\frac{1}{4}$ miles, and E.N.E. $1\frac{1}{4}$ miles, with an average width of $1\frac{1}{4}$ miles. One mile outside of it soundings are found in 7 fathoms.

Shoalwater bay, as its name implies, is so full of shoals that at low tides about one-half of its area is laid bare. Good but narrow channels are found throughout its extent, but no direction can be given for running them. Without a knowledge of these channels, or without a pilot, follow them only at low water. The currents then run with

great velocity, and it is very difficult and frequently impossible to keep a course against them. The arm stretching southward toward Baker bay is 15 miles long from Leadbetter point, with an average width of not less than $8\frac{1}{2}$ miles, whilst the upper portion stretches to the N.E. for 9 miles to the north of the Whil-a-pah river, reckoning from the middle of the line joining cape Shoalwater and point Leadbetter.

The principal stream emptying into the bay is the Whil-a-pah, at its north-east part. At about 9 miles from cape Shoalwater it is less than a quarter of a mile wide, with low swampy banks and steep bluffs on each side about $1\frac{1}{2}$ miles apart.

The mouth of the Palux, or Copalux, lies 5 miles N.E. $\frac{1}{2}$ E. from Leadbetter point. It is half a mile wide at its mouth, contracts very much in 2 miles, and is bordered by marshes, with numerous sloughs running through them.

The Nasal enters about 11 miles south from the Palux, and abreast the middle of Long island. It has over 20 feet water at its mouth, with bluff banks for some distance, until it begins to expand, when it is bordered by flats.

Several streams open from the north side of the bay. One of these, the Neco-manche, near the Whil-a-pah, has 6 feet in the main channel, and shows $1\frac{1}{2}$ miles wide at high tide.

There are three islands in the bay. Pine island, about $1\frac{1}{2}$ miles N.W. by N. from the mouth of the Palux, is a small sand islet of only 4 or 5 acres in extent, and occupied by oystermen. It is near the channel and the oyster beds which stretch for a couple of miles to the N.N.E. of it. The Indian name of this island is Nass-too. The north end of Long island is 8 miles from Leadbetter point. This island runs irregularly about S.E. for 6 miles, and has an average width of $1\frac{1}{2}$ miles. It is covered with a dense forest of fir and undergrowth. One mile S.S.E. of Long island is a very small islet named Round island, of only a few acres in extent, covered with wood and bushes. The shores of the bay, except on the peninsula, are mostly composed of low perpendicular cliffs of a sandy clay.

The peninsula is a long sandy plain, elevated but a few feet above the level of the sea, and covered, like the entire surface of this country, with a dense growth of gigantic forest trees, principally spruce, fir, and cedar, with a few specimens of maple, ash, and black alder. The spruce frequently attains a diameter of 8 feet. The Indian name of the peninsula is Tee-choots.

The shoals are covered with shell-fish, among which the oyster is the most abundant, and the principal article of export. They are small and have a coppery taste. Cod-fish and halibut abound; sturgeon, said to be of good quality, are plentiful, and salmon of several varieties and excellent flavour exist in infinite numbers. In spring vast shoals of small herring enter the bay. In winter wild fowl are innumerable, but these have been made shy by the bad shooting of the Indians. Black and white swan, geese, mallards, canvas-backs, &c., always reward the experienced sportsman.

The yearly shipment of oysters is about 80,000 bushels, and of piles and spars about 80,000 feet. The average value of exports is \$120,000. The number of vessels entering yearly is about 25, nearly all of which are schooners, counting an aggregate of 2500 tons. In 1855 the population on the bay was about 260.

Shoalwater bay was discovered by Lieut. John Meares, July 6th, 1788, in the *Felice*,

when proceeding in search of the Rio de San Roque of Heceta. He approached it until the water shoaled to 8 fathoms, when the breakers ahead warned him to haul off. "From the mast-head it was observed that this bay extended a considerable way inland, spreading into several arms or branches to the northward and eastward, and the mountainous land behind it was at a great distance from us." He saw "what appeared a narrow entrance at the north-west part of the bay," but it was too remote for him to discover whether it really was so, or only low land.

It is asserted by settlers here that boats, canoes, &c., which have broken adrift and gone out of the bay, have, in every instance, been found on the beach north of the entrance, and generally between it and Gray harbour.

From cape Shoalwater to point Hanson, the southern side of the entrance to Gray harbour, the distance is $13\frac{1}{4}$ miles, and the hard ocean sand-beach furnishes an excellent road that can be travelled at half tide by waggons. The slightly elevated sandy bank is level, covered with coarse grass, and free from timber for nearly half a mile back, and to within 2 miles of the harbour. Back of this and parallel with the coast is a cranberry meadow, 6 miles in length, and separated by a narrow belt of scrubby fir. This meadow is drained by two small rivulets forcing their way through the sand to the ocean. San Francisco is the market for the cranberries, which are gathered by Indians and carried to Shoalwater bay and Gray harbour. Land otter and beaver have their homes around the meadows and small streams.

GRAY HARBOUR.—The following is the description of the bay according to the surveys of 1862 and 1867. The bar at the entrance shifts so frequently and appears to be subject to such very great changes that instructions for entering it soon become useless, *strangers must therefore obtain the assistance of a pilot.*

The entrance to this bay is formed by point Hanson on the south, and the southern point of Eld island on the north. The northern end of this island is connected with the outer part of point Brown at low water, but at high tide the beaches are a quarter of a mile apart. The south end of the island lies N.W. by W. $\frac{1}{4}$ W., $1\frac{1}{4}$ miles from point Hanson; its length is $1\frac{1}{4}$ miles, and direction N.W. $\frac{1}{4}$ W., with a breadth of 200 to 400 yards. Half-way between point Hanson and the island lies the north-east end of a shoal or middle ground, bare at low water, and stretching S. by W. $\frac{3}{4}$ W. for $1\frac{1}{4}$ miles, with an average breadth of 4 cables. The channel in is between the north-east end of this shoal and the south end of Eld island; it had in 1862 a width of less than 6 cables and a depth of 16 fathoms. In 1867 the channel ran thence nearly S.W. $2\frac{3}{4}$ miles to the bar, which had 25 feet water on it, and was situated $8\frac{1}{4}$ miles W. by S. $\frac{1}{4}$ S. from fort Chehalis flagstaff, half a mile south of the extremity of point Hanson, and S.W. $\frac{1}{4}$ S. $2\frac{3}{4}$ miles from the south point of Eld island. At that time the channel was straight and indicated by buoys, the positions of which were changed to correspond with the changes of the bar and channel.*

* In 1860 the surveying brig *Fauntleroy*, drawing 10 feet of water, laid off the bar several days, the heavy breakers along the whole shoal allowing no clue to the bar, and the depth of water upon it unknown. At a comparatively smooth time the bar was sounded with a boat and the vessel followed, crossing on the last quarter of the ebb with 2 $\frac{1}{2}$ fathoms. In 1861 the entrance was reported tolerably good, and comparing favourably with the other bar harbours north of San Francisco,

In 1860, while the surveying vessel was lying off the bar, a current running to the northward at the rate of $1\frac{1}{2}$ miles per hour was distinctly noticed. Immediately off the harbour this current strikes the ebb current of the bay and deflects the mass of water to the northward. With the flood current the mass of water sets over the south sands. It is estimated that the off-shore current runs across the bar at an average rate of 8 miles.

The Indians use a small swash channel under point Brown, to avoid crossing the bar.

The peninsula terminated by point Hanson is about three-quarters of a mile in breadth and $8\frac{1}{2}$ miles long, and covered with fir to within half a mile of the point, which is a low sand-spit embracing a small marsh. The general direction of the peninsula is north-west, and inside it lies South bay, with a width of half a mile, affording the safest, and in fact the only safe anchorage near the entrance. More than half of this bay is occupied by mud flats. To secure the best position here, bring the northernmost trees on point Hanson to bear S. 71° W., distant three-quarters of a mile, and anchor in the channel in $3\frac{1}{2}$ fathoms. This position places the vessel out of the influence of the south channel running to the Chehalis (1862).

The anchorage under point Brown is not only uncomfortable but unsafe to a vessel without heavy ground tackle. At this point there is no protection against the full sweep of the heavy summer winds, which, blowing at times counter to the strong currents in the bay, cause a very disagreeable, short sea. Another circumstance tends to render this anchorage unsafe: between point Hanson and Eld island lies the Middle shoal, which, being bare at low water, confines the water to a narrow regular channel; but when the tide rises sufficiently to cover this shoal the conflicting currents cause a heavy overfall, especially on the large tides, strong enough to tear a vessel from her anchors (1860).

The peninsula terminated by point Brown, is about a mile in breadth and $4\frac{1}{2}$ miles long; its general direction is S.E. by S. The bay shore is covered with fir. The outer shore is the commencement of a sand waste, stretching towards the Copalis river. Between the timber and this waste is a lagoon, and outside that the sand is covered with coarse grass and stunted bushes. From the north end of Eld island a body of water stretches into the sand parallel with and near the ocean beach for about a mile. Close under the bay shore of this peninsula runs a narrow crooked channel, which in 1792 had a depth of 4 fathoms.

From point Hanson the mouth of the Chehalis river bears N.E. $\frac{1}{2}$ E. distant 12 miles; and this course is the general direction of the south-east side of the bay, except the indentation forming South bay. The first bluff inside the point is named Stearns. Around the south-west side of this bluff comes John river. Within $1\frac{1}{2}$ miles of the mouth of the Chehalis the Neuskah' enters, coming from the south-east.

In June 1862, the same vessel laid off the bar several days, and finding no possibility of crossing, ran into Shoalwater bay, and the party being unable to procure a pilot that could carry her into Gray harbour, had to work from the former bay. There were only three days during the season when work could be executed on the bar, and the result showed that no well-defined channel then existed across the bar, which was very uneven, lumpy, and in one place had only 9 feet upon it. The channel was not straight, as anticipated, but the seaward end curved well to the northward.

From point Brown point New bears N.E. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles; off the latter are two rocks, named Ned rocks.

Brackenridge bluff commences about three-quarters of a mile east of point New, and extends 3 miles eastward to the low land bordering the Hoquiamts river. From point New the shore-line runs nearly straight to the Chehalis, distant 8 miles, and the point of Stearns bluff lies S.E. $\frac{1}{2}$ S., distant $4\frac{1}{2}$ miles.

N.N.W. of the line joining points New and Brown lies North bay, consisting of an immense mud flat, bare at low water, and having an area of 22 square miles. At its head lies Saddle hill. In the stretch of 4 miles north-west of point New are three small streams, known as the Typso, Chinois, and Humtolapy, emptying into North bay. They work narrow crooked channels through the mud flats, but at low water there is not sufficient depth to carry a whale-boat through them.

More than nine-tenths of Gray harbour is bare at low water. Inside of the entrance the area of the surface of the water, bounded by the flats, bare at low tide, is only $4\frac{1}{2}$ square miles. This will give a fair idea of the limited extent of the harbour. Through the flats lying between this available space and the Chehalis run two contracted channels. The northern, which commences at a point 2 miles E.N.E. from point Brown, is the only available one, and would require buoying out for its entire length. For about 6 miles it is, or was, about 4 cables wide, with a depth of 4 fathoms. The south channel commences just inside point Hanson, and is very contracted and shallow. The flats are so extensive, and the mud so soft in places, that it is impossible to reach the shore, except at high tides. This fact has retarded the development of the trade in lumber, although the shores are heavily timbered.

The Chehalis river has been navigated by a small steam-boat for 20 miles, to the mouth of the Latsop, which comes from the northward. This is the head of the tide-water; but enterprise would render the river navigable much higher. Boats have come from the bend of the Chehalis, at the mouth of the Skookumchuck, near the road passing from the Cowlitz river to Puget sound. The country behind the bay appears low and flat, and well watered by the Chehalis and tributaries, which drain a section well timbered and dotted with many small prairies and bottom lands.

Copalis River.—From point Brown the shore-line trends about N.N.W. for 10 miles to the mouth of the Copalis. The barren waste of point Brown continues along this shore, commencing with a breadth of over one mile, stretching from the ocean to a dense forest of fir, and growing narrower as it approaches the Copalis, where the timber comes to the water's edge.

This stream is about 100 yards wide, but the mouth is almost closed by a bar. Upon its banks reside the Copalis tribe of Indians, from whom the river derives its name. Like all the streams on this coast it abounds in salmon, but those caught here are celebrated for their richness of flavour. Their general appearance is similar to those of Columbia river, but this variety rarely exceeds 2 feet in length. They weigh from 5 to 10 lbs.

Point Grenville.—From the Copalis river to this point the shore runs N.W. $\frac{1}{2}$ N. about 16 miles, and continues low, nearly straight, and bordered by sand-beach, which changes to shingle, disposed in long rows parallel with the coast. These ridges of

shingle dam the mouths of many small streams and form ponds, abounding in trout, and well stocked with beaver and otter, according to the accounts of the Indians. The high land also approaches much nearer the beach, and forms sandstone cliffs, with rocky ledges projecting into the ocean.

Point Grenville is a bluff rocky promontory, stretching westward about a mile, and then southward about a quarter of a mile, forming a very contracted and exposed roadstead. The 8-fathom curve extends about half a mile from the beach, compelling vessels, except of very light draught, to anchor so far out that the point and the rocks off it afford but little protection from the north-west winds. It is useless during the winter months. The point has high hills lying behind it, and many rocks immediately off it; two of these rocks, about 75 feet high, lie E. by S. 400 yards distant; another lies S.W. $\frac{3}{4}$ S. half a mile distant,—this has a depth of 5 and 6 fathoms all around it, and, we believe, is the one that shows a large perforation through it when viewed from the south-east or north-west. Other rocks stretch along the coast to the north-west; one of them, when seen from southward, resembles a sail. The bluff itself is composed of fine sandstone, is very steep, and may be ascended by a difficult trail, which is used by the Indians. It is said to be a great resort for sea otters, which are hunted by the natives. Its approximate geographical position is lat. $47^{\circ} 20'$, long. $124^{\circ} 14'$. From cape Disappointment light it bears N.W. by N. $\frac{1}{4}$ N., distant 62 miles, and from the cape soundings may be had in 8 to 15 fathoms, 8 or 4 miles from the shore.

In June 1855, the surveyors discovered in the direction of W. by N., distant 16 miles from point Grenville, "a bank having 15 fathoms upon it, with very soft mud bottom; at 21 miles distance, 17 fathoms; and at 29 miles, 86 fathoms; and 8 miles S.S.E. of the first position we struck $16\frac{1}{2}$ fathoms, with the same bottom, in all the soundings; but had not time to make an extended examination. In April 1856, we found 45 fathoms in lat. $46^{\circ} 54'$, long. $125^{\circ} 8'$, being 16 miles broad off shore. The soundings of 17, 18, and 19 fathoms, one mile from shore, would indicate a greater depth than we obtained. Vancouver has 50 fathoms inside of our first soundings."

North of point Grenville to cape Classet the shore is bold and rocky, with occasional short reaches of sand-beach. The timber comes down to the water; moderately high hills approach the coast, through which empty numerous small streams, whilst the irregular Olympus range looms up far in the interior. In winter these mountains are covered with snow, which lies in the gorges and valleys nearly the whole summer. Mount Olympus, the highest peak of the range, is estimated to have an elevation of 8188 feet.

From point Grenville, the coast begins to increase gradually in height. The shores, in passing, will be observed to differ in some respects from those southward of it. They are composed of low cliffs rising perpendicularly from a beach of sand or small stones, with many detached rocks of various remarkable forms lying at the distance of about a mile from them. The soundings are regular, of 16 to 19 fathoms, soft sandy bottom.

Along this part of the coast there appears to be a current setting northward at a uniform rate of nearly half a league per hour, as Vancouver remarks, that after passing cape Orford he was carried northward more rapidly by 10 or 12 miles per day than he

expected. He also observes that in the vicinity of Destruction island, the strong current or tide set him in-shore, so that he was obliged to anchor in a depth of 21 fathoms, on a bottom of soft sand and mud, at about $3\frac{1}{4}$ miles S.S.W. from the island. This in-shore set of the current was also experienced by Commander Wilkes, U.S.N., 1841.

The coast from Destruction island continues to increase in height to the northward. Off it are many rocky islets and sunken rocks, extending in some places a league from the shore. Soon after passing the outermost of these rocks cape Classet, the south point of the entrance of Juan de Fuca strait, may be plainly distinguished.

Quéníutl River.—The mouth of this small stream is between 3 and 4 miles N.W. by W. from point Grenville, and is almost closed by the shingle and gravel thrown up by the surf; there is, however, a contracted opening for the passage of canoes in calm weather. The closing of the entrance has so dammed the river as to form a small lake inside, upon the banks of which is situated a village of the Queniutls, a race of Indians hostile to all other tribes. Combined with other Indians to the northward they have ever been notorious for their hostility and vindictiveness to the whites. Several Spanish, English, and Russian vessels and their crews were, in former times, taken and destroyed. Hence we meet with the names Destruction island, Isla de Dolores, Punta de Martires, &c., in this immediate vicinity. The river is said to flow from a lake at the foot of the mountains.*

For 4 miles above the Queniutl the coast trends in the same direction, N.W. by W., is composed of sandstone cliffs, and bounded by many precipitous rocks, the height and direction of which are generally that of the cliff. In the Coast Survey reconnaissance of 1852, one is placed $2\frac{1}{2}$ miles off shore in latitude $47^{\circ} 27'$, and the vessel's track is laid down inside of it. A great many large rocky islets lie close in-shore in this vicinity, but northward the coast is nearly clear to Destruction island. It makes a slight curve eastward, and alternates with bold yellow cliffs and low shores.

Destruction Island.—This island is the only one on the coast deserving the appellation after leaving the Farallones, off the bay of San Francisco. It is about 75 feet high, flat on the top, covered with grass, but destitute of trees, and has high perpendicular sides of the same height as the cliffs on the main. It is said that there are some remarkable perforations through a rock near it, but these are doubtless, only seen in particular directions, for, in passing close to it, the surveyors did not observe them. On the eastern end were formerly some rude Indian huts. In Vancouver's time two or three dwarf trees grew at each end.

When running along the coast, 10 miles off, it is very difficult to distinguish

* The name of this river is usually known by the old settlers as Qué-noith, but the Indians are said to pronounce it as if spelled Qué-ni-utl, accenting the first syllable strongly, and the last so softly that many persons consider they call themselves simply Quo-nai. A tribe still farther north is called the Que-naít'-sath. The Muckaws call it the Quin-aitl. De Moiras calls it "Kinuat."

These Indians, when travelling by canoes along the low sandy beach south of point Grenville, push out into the rollers, keep between the line of two seas that have broken, and pole the canoe through the surf. This peculiar mode is rather apt to excite the fears of those ignorant of what a canoe can be made to do when skillfully handled,

this island, because, being within $8\frac{1}{2}$ miles of the main, it is projected against the coast cliffs and cannot be distinguished from them until close upon it.

The general direction of the island is N.N.E. and S.S.W., its extreme length is nearly half a mile, and its width is about 800 yards at the widest part near the southern end. Towards the north it tapers to a small round point, from which projects a gravelly tongue about 200 yards long, curving to the north-west. Just beyond this tongue is a ledge sweeping to the westward one-third of a mile, with a few detached rocks awash outside. Off the northern end of the island and ledge a number of large detached rocks, with 3 and 5 fathoms between them, extend in the general direction of the island, nearly a mile from the edge of the bluff, heavy breakers generally exist throughout this rocky patch. The western approaches to the island present a very rocky uneven bottom entirely unfitted for anchorage. About 220 yards south of the extremity of the reef at the southern end of the island and a quarter of a mile from the island there is a sunken rock with 16 feet water upon it. The whole extent of the island and reefs is not more than $1\frac{1}{2}$ miles in length by half a mile in width. It affords no protection whatever against S.E. winds; in fact, proximity to the island at such times is highly dangerous.

Between the island and the main the soundings range from 7 to 12 fathoms, and northward of it from 10 to 14 fathoms. The approximate geographical position of the north end is lat. $47^{\circ} 41'$, long. $124^{\circ} 25'$. From cape Disappointment it bears N.W. by N. 84 miles.*

From Destruction island northward the shore is composed of cliffs which form a regular curve to a point bearing N.W. $\frac{1}{4}$ W. from the north end of the island, and 11 miles distant; thence the shore runs nearly straight on that course for 10 miles to two high, abrupt, and well marked rocks, standing a mile from shore. The outer one is bold and covered with tall trees, but the inner one is bare. They are in about lat. 48° , long. $124^{\circ} 40'$. Many others, but smaller, lie inside of them, and 19 fathoms are found close outside. Along this stretch the shore is irregular and bluff, with many high rocky islets off it. About 15 miles from Destruction island, off the mouth of a stream, there are two rocky islets covered with trees, showing a cave in the sea-face of the southern and larger one. They are close to the low beach, and behind the larger one is a stockaded village. About 3 miles northward of these rocks is Table rock, about 70 feet high, and one or two miles off shore.†

Flattery Rocks.—From the rocks off the coast in about lat. 46° to cape Classet, in lat. $48^{\circ} 28'$, the course is almost N.N.W., passing through a group of high, well-marked, rocky islets, in lat. $48^{\circ} 11'$, named the "Flattery rocks." Before reaching these the coast-line curves about a mile eastward, with a bluff shore nearly free from

* This island is called Isla de Dolores upon old Spanish maps. It received its present name (by which only it is known on the coast), in 1787, from Captain Berkeley, who sent a long-boat from King George sound to explore as far south as latitude 47° . The crew of a smaller boat entered a shallow river and rowed up some distance, where they were attacked and murdered by the Indians.

† Meares calls the curve of the coast about Destruction island, "Queenhythe bay," evidently a corruption of the Que-ni-ult, or Que'-noith.

rocks for about 8 miles, when a large white rock, half a mile out, looms up prominently, and is distinctly seen against the main land.

Flattery rocks extend between 2 or 3 miles from shore; the outer ledge is awash with one islet in it, and the track of the coast surveying steamer is laid down inside of it, with soundings in 9 to 20 fathoms. High islets, covered with timber, lie inside, with their ocean faces nearly perpendicular, about 150 feet high, and sloping landward. Where destitute of trees, these are covered with grass, bushes, &c. The approximate latitude of the rocks is $48^{\circ} 12'$.

From Flattery rocks a high rocky coast, bordered by outlying rocks, continues for 8 miles, when a low sand-beach occurs, receiving a small stream which runs E.N.E. and finally North, behind the mountain constituting cape Classet, to within 200 yards of the beach in Neé-ah bay. A rise of 20 or 30 feet of the sea would make cape Classet an island, extending 5 miles W.N.W. by 3 miles in breadth. This creek is used by the outer coast Indians during the prevalence of heavy winter gales, when the passage outside the cape would be impracticable.

From point Grenville to cape Classet the hills rising from the coast are about 2000 feet high, densely covered with trees, and cut up by innumerable valleys. The shore is inhabited by numerous tribes of Indians, accustomed to war and bitterly hostile to the whites.*

Tatoosh Island and Light.—This island lies W.N.W. half a mile from the point of cape Classet. It is composed of small islets connected by reefs, is quite flat-topped, and without trees. The surface is 108 feet above high water, and the sides are perpendicular; the entire mass is composed of coarse sandstone conglomerate with an outcrop of basalt on one of the reefs. There is a depth of 2 or 3 feet of soil upon the top, which was formerly cultivated by the Indians, who resorted here in summer, about 150 strong, and had several houses near the only boat landing on the inside of the island (1852). A reef extends a quarter of a mile off the west side of the island, and the whole extent of the island and reef is only half a mile W.N.W. by a third of a mile. Deep water is found upon all sides, except between it and the cape, where a reef exists upon which the sea breaks very heavily in bad weather. It has been asserted that small vessels have gone through this channel when caught by an unfavourable wind;—in so doing great risk must have been incurred, as the currents in the vicinity run very irregularly and strong.

From the top of the island a leaning rocky column, about 140 feet high and 50 feet in diameter, is seen to the south-eastward close under the face of the cape. It is sometimes called Fuca's pillar.

The lighthouse standing on the highest part of the island consists of a brick tower,

* These Indians are far superior to those found along the coast to the southward. Their villages are heavily stockaded, and the houses made of cedar boards, which they have cut with great industry from the tree; some of these boards are over 4 feet wide and 20 feet long;—the outside edges being about an inch thick and 3 inches in the middle. Their houses are very large, and partitioned off into stalls for each family. The numerous streams emptying upon the coast afford them a never failing supply of the finest salmon; and to obtain means of barter with white traders they fearlessly attack and capture the different species of whale on the coast.

whitewashed, rising from a dwelling and surmounted by an iron lantern painted red. It exhibits a *fixed white* light, at 162 feet above the sea, visible about 20 miles. Its geographical position is lat. $44^{\circ} 28' 20''$, long. $124^{\circ} 44' 30''$. The arc of illumination seaward from the lighthouse, starting from the land southward, is 268° , hence it is also a useful guide to vessels in Juan de Fuca strait. A fog-whistle gives blasts of 8 seconds duration at intervals of 52 seconds, during foggy weather.

Duncan Rock.—This is a small, low, black rock rising above the highest tides, but always washed by the western swell, which breaks over it. Deep water is found close around it. From Tatoosh island light it bears N.W. by N., distant rather more than a mile, and many vessels pass between them, as the chart shows 25 to 40 fathoms; but a rock having been reported in about midway, it would be prudent to avoid this channel until the doubt is set at rest. Vancouver's vessels passed between them.

During a three months' stay at Neé-ah harbour in 1852, the surveyors tried upon several occasions to land upon this rock with canoes, but without success.

Duntze Rock.—At nearly a quarter of a mile N.W. by N. from Duncan rock, and consequently with that rock in one with Tatoosh island, is Duntze rock, upon which is a depth of 8 fathoms. The sea usually breaks upon it with great violence. Close to the north side of this rock is deep water, of 60 to 100 fathoms.

With no wind, a heavy swell from the west, ebb current, and proximity to these outlying rocks and island, a vessel's position is unsafe, and great caution should be exercised in navigating this part of the entrance to the strait of Fuca.

CAPE CLASSET.*—Cape Classet (or Flattery) forms the southern head of the entrance of the strait of Juan de Fuca; it has a bold rugged sea-face, about 100 feet high, much disintegrated by the wearing action of the ocean; in a mile it rises to an irregular hill of 1500 or 2000 feet in height. The Cape is cut up by gorges and covered with a dense growth of fir and almost impenetrable underbush from the edge of the cliffs to the summit. The shore-line round to Nee-ah bay is of the same forbidding character, bordered by reefs, and having but one short stretch of beach at the foot of the hills. Upon this beach is situated (or was in 1852) Clisset village. The soundings half a mile from shore are deep and irregular, reaching 68 fathoms. The current runs as much as 8 miles per hour, and during the ebb sets irregularly round the cape, Tatoosh island, and Duncan rock. When seen from south-westward cape Classet looks like an island, on account of the valley 8 or 4 miles eastward of it. The best position for seeing this is when a single rock off the cape shows itself detached. From this direction the high mountains on Vancouver island loom up and stretch far away to the north-west and to the east.

At the entrance to the strait of Juan de Fuca, 15 miles (by estimation) W.N.W. from cape Classet, is said to be a bank, having 18 fathoms upon it, which is much frequented by codfish. When the surveyors were encamped in Nee-ah bay, in 1852,

* So named by Vancouver in 1792, probably from the tribe of Indians, or chief of the tribe inhabiting that region, and by this name British geographers usually recognise it; but in the American coast survey charts it is called cape Flattery, Captain Cook having given it the latter name in 1778.

the Indians frequently went out upon some bank off the strait to fish for cod, but their assertions were looked upon with distrust, as it was believed that they caught the fish inside of the strait. Circumstances have hitherto prevented an examination of this bank.

STRAIT OF JUAN DE FUCA.

Magnetic Variation in 1980.—At the entrance of the Strait $22\frac{1}{2}^{\circ}$ E.; Off Royal bay $22\frac{1}{2}^{\circ}$ E. The annual increase is estimated to be 2 minutes.

Juan de Fuca strait has its entrance between latitudes $48^{\circ} 23'$ and $48^{\circ} 36'$, on the meridian of $124^{\circ} 45'$. It runs eastward as far as long. $122^{\circ} 45'$, or as far as the west coast of Whidbey island. Its geographical position makes it liable to all those sudden vicissitudes of weather common to high northern latitudes; and in few parts of the world is the caution and vigilance of the navigator more called into action than when entering it.

The breadth of the strait between cape Classet or Flattery, its southern point, and Bonilla point, (Vancouver island) its northern, is 18 miles; within these points it soon narrows to 11 miles, and carries this breadth on an East course for 40 miles, or until Race Islands bear N.E. by E., distant 10 miles; it then takes an E.N.E. direction for a farther distance of 14 miles to the shore of the continent, or more properly Whidbey island.

Between Race islands and the southern shore the breadth of the strait is 8 miles, after which it immediately expands to 17 miles, leading northward to the British possessions by various channels among the labyrinth of islands known as the Haro archipelago, and southward to those of the United States, by Admiralty inlet and Puget sound.

The coasts of Juan de Fuca strait are bold, abrupt, and covered with a heavy growth of varied timber and dense underbush. They are remarkably free from danger, and may be approached safely within half a mile; there is one breaking rock which lies nearly that distance off the west point of Crescent bay on the southern shore.* The soundings in the centre are of great depth, no bottom being found in its deepest parts with 150 fathoms of line; but within $1\frac{1}{2}$ miles of either shore there is generally under 40 fathoms, and on the northern side when 5 miles eastward of port San Juan, 8 to 12 fathoms will be found within a mile of the shore, and, if necessary, vessels

* It may be here remarked that almost all the rocky shoals and dangers in these latitudes are well marked by kelp; indeed the Kelp line, to a stranger, is in every instance the danger line, and should be avoided, for though it will sometimes show in a depth of even 40 fathoms, it is always indicative of the presence of rocks, and should not be ventured into unless it has been well ascertained to be free from sunken dangers.

may anchor. On both sides of the strait there are several anchorages or stopping places which may be taken advantage of by vessels, either inward or outward bound when meeting with adverse winds;—those on the southern side are Neé-ah and Callam bays, port Angelos, and New Dungeness bay, all westward of the harbours of Admiralty inlet; on the northern side are port San Juan, Sooke inlet, and Becher bay, all westward of the Race islands, eastward of which excellent anchorage may be always obtained with westerly winds.

On the northern or Vancouver island shore of the strait the hills rise gradually and are densely wooded, but near the coast attain to no great elevation. On the southern side the almost perpetually snow-clad mountains known as the Olympian range, rise more abruptly and vary in elevation from 4000 to more than 7000 feet; but though exceedingly grand in their rugged outline, present no very marked summits as seen from the strait nor any great variety in their features;—on this shore a steep cliffy coast commences at 30 miles from cape Classet and continues for about 50 miles,—it is 50 to 200 feet high and a flat country behind extends nearly to the base of the Olympian range and stretches further southward as the eastern part of the strait is approached. On the east the face of Whidbey island is very steep; it is about 250 feet high and appears flat, as does the whole country eastward to the sharp-cut outline of the Cascade range, stretching its serrated ridge northward, where the snow-peak of mount Baker is distinctly seen, and to the southward, where the higher peak of mount Rainier attracts the eye,—this mountain is believed to be more than 15,000 feet high.

Tides.—It is high water, full and change, at cape Classet at noon and at midnight; the ebb stream there commences to run strong at 2h. A.M. and P.M. and continues for about 6 hours.

In the outer part of Juan de Fuca strait there is no very great strength of tide; it varies from 1 to 4 knots, seldom so much as the latter unless near cape Classet; but when approaching the more contracted part in the neighbourhood of the Race islands, which receives the first rush of the pent up waters of the strait of Georgia, strengthened and diverted by the labyrinth of islands which choke up its southern entrance, it is not surprising that eddies, races, and irregularities occur which almost baffle any attempt at framing laws which may not rather embarrass than assist the seaman; the result, however, of observations continued throughout an entire year at Esquimalt, and partially on other parts of the coast during three seasons, appears to warrant the following conclusion, viz:—

The flood tide sets to the northward along the outer coast of the continent and Vancouver island. It enters the strait of Fuca at cape Classet, running with considerable velocity, sometimes 3 or 4 knots over Duncan and Duntze rock; it then turns sharply into the strait, passing through the various channels among the Haro archipelago into the strait of Georgia, and within about 5 miles of cape Mudge, where it is met by a flood from the northward, which, sweeping the western coast of Vancouver island, enters Goletas channel and Queen Charlotte sound at its northern extreme, in lat 51°, thence southerly down the narrow waters of Johnstone strait and Discovery passage, meeting the tide which enters by Fuca strait, and reaches about midway

between the northern and southern extremes of Vancouver island, or close to the spot where the broad expanse of the strait of Georgia merges into the narrow channels adjoining it.

On the western side of the island the tides were found to be regular—flood and ebb of 6 hours' duration, the times of high water on the full and change at Nootka sound, and at the entrance of Goletas channel varying very little, and occurring near noon, the greatest range 18 feet; nor is any marked irregularity observable in Johnstone strait and Discovery passage, except the not unusual circumstance that the ebb stream continues to run to the northward for 2 hours after it is low water by the shore, the water rising at the same time, the ebb stream being of 7 hours' duration, the flood about 5 hours.

The great and perplexing tidal irregularities may therefore be said to be embraced between the strait of Juan de Fuca, near the Race islands, and cape Mudge, a distance of 150 miles; and a careful investigation of the observations made at Esquimalt, and among the islands of the Haro archipelago, shows that during the summer months, May, June, and July, there occurs but one high and one low water during the 24 hours, high water at the full and change of the moon happening about midnight, and varying but slightly from that hour during any day of the three months; the springs range from 8 to 10 feet, the neaps from 4 to 5 feet. The tides are almost stationary for 2 hours on either side of high or low water, unless affected by strong winds outside.

During August, September, and October, there are two high and low waters in the 24 hours; a superior and an inferior tide, the high water of the superior varying between 1h. and 8h. A.M., the range during these months from 8 to 5 feet, the night tide the highest.

During winter almost a reversal of these rules appears to take place; thus, in November, December, and January, the 12-hour tides again occur, but the time of high water is at or about noon instead of midnight.

In February, March, and April, there are two tides, the superior high water occurring from 1h. to 8h. P.M. Thus it may be said that in summer months the water is low during the day, and in winter low during the night.

The ebb stream has always been found to run southward through the Haro archipelago, and out of Fuca strait for 2½ hours after it is low water by the shore, the water rising during that time; the ebb is stronger than the flood, and generally two hours' longer duration.

The tides during those months when two high and two low waters occur in the 24 hours, are far more irregular than when there is only one 12-hour tide, and another anomaly exists, viz., the greatest range not unfrequently occurs at the first and last quarters, instead of at the full and change of the moon.

Currents.—A southerly current has been found to prevail on the western coast of Vancouver island more or less throughout the year, particularly from August to November, probably in some measure caused by the N.W. winds which blow constantly during the summer. This current joining the ebb tide out of Fuca strait has been known to set vessels between 4 and 5 miles an hour to the southward, and during fogs there is great risk of being drifted on to cape Classet, or some of its

off-lying dangers; extreme caution should therefore be observed in entering the strait at such times, especially near the full and change of the moon, when the tides are at their strongest.

Winds.—Within the strait of Juan de Fuca, in the winter season, the winds usually assume its direction either up or down. During summer, the prevailing winds from N.W. or S.W., take a westerly direction within the strait; while the S.E. gales of winter blow fairly out.

Although a westerly wind may be blowing within the strait, it frequently during the change of the seasons blows heavily outside at the same time from S.S.W., or sometimes suddenly changes to that direction, from a light easterly wind on opening the entrance, which makes that part of the coast of Vancouver island between port San Juan and Bonilla point a dangerous lee-shore to a ship without steam power.

The coast winds in summer prevail from S.W. and N.W., the former during the early months, and the latter blow fresh and with great regularity during June, July, and August. In September and the early part of October the winds are very uncertain and there is generally a great deal of calm, gloomy weather.

The barometer usually stands above 30.00 inches during summer; should it fall to 29.90 a south-easterly wind with thick rainy weather may be expected, but of short duration and clearing up with a westerly wind as soon as the barometer rises.

The winter winds are S.E. and S.W., more frequently the former; they set in towards the end of October, and continue until the middle of April. S.E. gales are generally preceded by a short interval of calm, cloudy weather; they spring up gradually from East or E.S.E. veering to the southward, accompanied by rain and thick weather, the barometer falling rapidly; when the barometer becomes stationary the wind shifts suddenly to S.W. and blows heavily with clear weather, but frequent squalls of rain; the barometer begins to rise immediately the wind veers to S.W., from which quarter it generally blows from 12 to 20 hours.

The violence and duration of these S.E. gales are always proportioned to the fall of the mercury; with the barometer at 29.50 a strong gale may be looked for from this quarter; it seldom falls below 29.20, when very bad weather is certain to follow. On two or three occasions in as many years it has been known to fall to 28.90, and has been followed by S.E. gales of great violence.

A S.E. gale sometimes springs up, though very seldom, with the barometer above 30.00 inches. On such occasions the wind has always been preceded by calm, cloudy weather and rain, with a high but falling barometer; such gales are not violent and of short duration.

S.E. gales are always accompanied by thick dirty weather, and rain; they seldom continue from that quarter for more than 12 or 18 hours, unless the barometer falls very low, and almost always shift to S.W.

When the S.W. gale of winter is not preceded by the south-eastern, the barometer seldom falls; it either remains stationary, when the gale may be expected to continue longer, or rises slowly, when it will gradually subside and fine weather follow. S.W. gales are accompanied by heavy banks of clouds, and passing showers of rain, sometimes snow.

The barometer has been known to fall during winter as low as 29.45 and has been followed by no gale or bad weather, but on such occasions there has been a heavy fall of snow on the hills, and a sudden fall of 15 degrees in the temperature.

A fine northerly or N.E. wind frequently occurs at intervals during the months of December, January, and February; it is always accompanied by a high barometer above 30.0, and at such times a continuance for several days together of clear, cold, frosty weather may be looked for; the barometer on these occasions will sometimes rise as high as 30.70, and the fine weather will then probably last a fortnight or more.

Fogs.—Although fogs in this region are not nearly of such frequent occurrence as on the neighbouring coast of California, where they prevail almost uninterruptedly during summer and as late as the middle of October, yet from August to November they occasionally occur in Juan de Fuca strait, and are sometimes very dense over the entrance for several days together. They are generally accompanied by calms or very light winds from N.W., which renders them more dangerous to sailing vessels closing the land.

Soundings.—Between the parallels of 48° and 49° the 100-fathom bank extends for 82 miles off shore, and for 5 or 6 miles on either side of the parallel of 48° 30', which passes through the centre of Juan de Fuca strait, no greater depth than 55 fathoms is found at the distance of 40 miles from the entrance. Steering for the strait within these limits of latitude, viz., a few miles on either side of 48° 30', from 55 to 60 fathoms will be carried for 20 miles, the bottom fine dark sand, sometimes varied by gravel and small stones, when it will deepen to 80 and 90 fathoms, generally muddy bottom, for a farther distance of 10 miles; a vessel will then be within 8 or 10 miles of the strait: if to the northward of 48° 30' the water should shoal to 36 and 40 fathoms rocky or gravel bottom; if to the southward it will continue deep and will increase to more than 100 fathoms, when within 8 or 9 miles of cape Classet.

The outer edge of the bank is rather steep, falling from 90 to 150 fathoms and then no bottom with the ordinary line. There is one peculiarity which should not pass unnoticed; the deep channel of over 100 fathoms, which runs through the centre of the strait, on entering the ocean is deflected to the southward, probably owing to the superior strength of the ebb stream and the southerly current, and a zone of deep water about 8 miles in width, with from 140 to 150 fathoms, extends in that direction to the 48° parallel; between it and the shore, a distance of about 8 miles, the depth decreases suddenly to 30 fathoms fine dark sand, and immediately outside it from 67 to 80 fathoms will be found.

Mr. Davidson, U.S. Coast Survey, says, 1869:—"During dry summers the Indians and settlers set fire to the forests in every direction, and the country soon becomes enveloped in a vast smoke that lasts for two or three months. At such times it is frequently impossible to make out the shore at half a mile distance. The strong westerly winds coming up the strait disperse it for awhile, but only to fan the fires and give them renewed force and activity.

In summer the prevailing wind draws into the strait, increasing towards evening, and frequently blowing a 10-knot breeze before midnight; but unless the wind is strong outside little is felt in the strait, and very frequently vessels are a week from cape

Classet to Admiralty inlet, or *vice versa*. In winter the south-east winds draw directly out, and create a very heavy cross sea off the entrance, the great south-west swell meeting that rolling out. In such cases trading vessels try to gain Neé-ah bay or San Juan harbour, and remain at anchor until the wind changes. In beating in or out vessels may run as close under either shore as wind and currents warrant, as no hidden dangers have been found half a mile off shore, except at the west side of the small indentation called Crescent bay, near Striped peak, 44 miles inside of Duncan rock.

At the entrance the currents acquire, during the 'large tide' of each day, a velocity of 4 miles per hour, and after strong north-west winds, a very large, short, but regular swell is encountered west of Neé-ah bay during the ebb current. If the wind is light, and no steerage way on the vessel, the feeling is decidedly disagreeable, especially as the current seems constantly to set close around Duncan rock and Tatoosh island. If a vessel falls into the trough of this swell she is bound to fetch away something.

Settlers are gradually advancing from Puget sound and Admiralty inlet along the strait westward, and are destined to meet those coming up the coast from Gray harbour and Shoalwater bay.

Washington Territory has a climate excelled only by that of California. We know not where to point to such a ramification of inland navigation, save in the British possessions to the northward. For depth of water, boldness of approaches, freedom from hidden dangers, and the immeasurable sea of gigantic timber coming down to the very shores, these waters are unsurpassed."

Directions.—Vessels from southward or westward bound for Fuca strait, except the coasting steamers which all carry pilots, should make cape Classet; there is no inducement to hug the coast, on which a long rolling swell frequently sets, and this swell meeting the south-easterly gales of winter, causes a confused sea. The cape and its off-lying rocks should not be approached within a distance of at least 3 miles, as the tide occasionally sets over Duncan and Duntze rock with great velocity, an additional reason why these dangers should not be too closely approached. It is equally necessary either in entering or leaving the strait to avoid the coast of Vancouver island between port San Juan and Bonilla point, when there is any appearance of bad weather.

It is recommended to pass at the distance of at least 10 miles from the coast, unless working to windward against a fine northerly wind, which is frequently found during summer, when it may be safely approached within 3 miles or less.

To vessels making the strait in bad weather it will be more desirable to run in and seek shelter than to remain outside. If the land has been made either to the southward of cape Classet or on the Vancouver island shore within a moderate distance of the entrance, or if the latitude can be relied upon within 2 or 3 miles, it will be advisable to run for the strait. The powerful light on Tatoosh island (cape Classet) will, unless in very thick weather, or fog, be seen at a considerable distance, and as soon as a vessel is actually within the strait she will have comparatively smooth water, with sufficient sea room, and may run boldly up the centre for the light on Race islands, or by the assistance of that on Tatoosh island, maintain her position in the strait if preferred. It is to be remarked that when Tatoosh island light is brought to bear westward of W.S.W., it becomes shut in by the land about Neé-ah bay, and that the

Race island light from a similar cause becomes obscured by Beechey head when brought to bear eastward of E. by N. $\frac{1}{4}$ N.; therefore, when either of these lights are obscured, the distance from either coast will be accurately judged, and in the latter case a ship will be getting too close to the northern shore.

Coming from westward with a heavy westerly or north-west gale, thick weather, and uncertain of the latitude, it would be prudent to lay by at not less than 80 miles from the entrance to the strait, or on the edge of the bank of soundings. These gales seldom last more than 12 hours, and if they veer towards the S.W. the weather will clear, and a vessel may immediately bear up for the strait.

With a S.E. gale it is recommended to close the land, smoother water will be obtained, and the bank of soundings off the Vancouver island shore will give a vessel pretty accurately her distance from the land. Gale from this quarter sometimes continue in the winter season for 80 hours, and when a vessel strikes soundings on the edge of the bank in 90 fathoms, and carries them into 60 she may put her head to the S.W., and will have plenty of room for drift.

It is of great importance in making the strait during bad weather to strike the outer edge of the bank of soundings, as the ship's distance from the land will then be accurately known. It has been already observed that after running 20 miles eastward the depth increases from 55 to 80 and 90 fathoms, which latter depths, if the lead has not been previously kept going, might be mistaken for the outer edge.

Should a sailing vessel be overtaken by one of those dense fogs which sometimes hang over the entrance of the strait, she should not close the land but stand off sufficiently far to avoid being set by the southerly current too near cape Classet. If a steamer has made the land or light, and is certain of her position, she should get the northern or Vancouver island shore aboard, when, with the assistance of the chart and lead, she may feel her way in. When 8 or 10 miles eastward of port San Juan there is anchoring ground in 12 fathoms a mile from the shore, and if the fog is very dense a stranger should anchor; it must be remarked, however, that not unfrequently the weather is clear a few miles within the strait while the entrance is totally obscured.

SOUTHERN SHORE OF THE STRAIT.

NEE-AH BAY.—From the lighthouse on Tatoosh island the coast trends 4 miles E.N.E. to Koitlah point, the western side of Nee-ah bay. From cape Classet the shore is nearly straight, high, and rugged, backed by hills about 1500 or 2000 feet high, and covered with timber. Deep water is found within a third of a mile of the bluffs, and at a distance of half a mile, a depth of 20 fathoms is obtained. Within a mile of Koitlah point was a large village of the Mukkaws, in 1852.

Nee-ah bay is about $1\frac{1}{4}$ miles long S.S.E., and the same in width at the entrance. The western side is high, precipitous, and bordered by craggy out-cropping rocks 800 or 400 yards from the shore. The 8-fathom line ranges about 600 yards from the foot of the bluff. The general direction of this side is S.E. for one mile, when the hills suddenly cease, and a low shore, with sand beach backed by woods, curves gradually to the N.E. by E. for $1\frac{1}{4}$ miles to Ba-ad-dah point, formed by a spur of the hills.

The east side of the bay is formed by Waaddah island, the northern end of which lies $1\frac{1}{2}$ miles from Koitlah point in an E. by N. $\frac{1}{4}$ N. direction. This island is a narrow high ridge, about 250 yards wide, and half a mile long, covered with trees, and having a direction S.E. $\frac{1}{4}$ E., pointing towards Ba-ad-dah point, and presenting the appearance of a continuation of that spur, but separated from it by a 4-fathom channel 500 yards wide. Off the south-west part rocks extend for 250 yards, and the 8-fathom line is 600 yards distant. Along the sand beach the 8-fathom line is within 200 yards of the shore, the depth increasing to 7 fathoms, then decreasing to 5 in the middle of the bay, and again increasing to 10 on the outer line of the bay. Much kelp abounds in this harbour, even in deep water.

The best anchorage is in the south part of the bay, in about 5 fathoms, being then off the small stream which comes in at the eastern foot of the hills. No direction can be given about anchoring off any particular village, as the Indians change their location so frequently; but near this stream will generally be found some houses, with an abundance of fresh water. During southerly weather little swell is felt here, and the wind can do no harm; but when a large westerly swell is coming up the strait it reaches here, and a vessel rolls uncomfortably unless she rides head to it.

The low ground abreast of the anchorage, and but 200 or 300 yards from the beach, is the head of a small stream that runs through the low prairie lands behind cape Classet, and empties into Nisco bay south of the cape, near a winter village of the Mukkaws, called Wa-atch. This stream is frequently used by them in winter, when they cannot take their canoes outside the cape.

Observations made behind the beach at about 400 yards eastward of the small stream before referred to, determined its geographical position to be lat. $48^{\circ} 21' 49''$, long. $124^{\circ} 37' 12''$. From the N.W. end of Waaddah island it bears S. by W. $\frac{1}{4}$ W., distant $1\frac{1}{2}$ miles.

"A good berth will be found in Nee-ah bay, in 6 fathoms sandy bottom, with the outer point of Waaddah island N.E. by N., and Koitlah point W. by N.; a short distance within this position kelp grows in large patches all over the bay, and some care is necessary in selecting a berth. Large sailing vessels may anchor in 7 or 8 fathoms a little outside the above bearings, in the centre of the bay, with the outer point of the island N.E. by E.

A vessel should leave this bay on any indication of a north-east wind, and if too late, and unable to weather Waaddah island, she may, with the assistance of the chart, run between it and the main; the passage is 2 cables in breadth, and the least water 21 feet; she must, however, be careful to avoid the ledge off the south-west end of Waaddah, and in hauling out should give the eastern side of the island a berth of at least a quarter of a mile. Vessels have ridden out north-west gales close to the south-east end of Waaddah in 6 fathoms, but it is more prudent to get out into the strait at the commencement of the gale. During strong westerly or south-west gales, or after they have been blowing outside, a considerable swell rolls into the bay, which renders it at such times a somewhat disagreeable though not unsafe anchorage; small vessels may go close in and get smooth water, even among the kelp which grows in 4 and 5 fathoms."—*Vancouver Island Pilot*, 1864.

Tides.—The corrected establishment of the port is 12h. 33m. The mean rise and fall of tides is 5·6 feet; of spring tides 7·4 feet; and of neap tides 4·8 feet.

At about 2 miles eastward of Waaddah island, and within the limits of the kelp, is a rock 150 feet high; behind it enters a small stream.*

CALLAM BAY.—From the eastern point of Nee-ah bay to Sekou point, the western part of Callam bay, the course is E. $\frac{1}{2}$ S., and distance $19\frac{1}{2}$ miles. The shore-line is nearly straight, bluff, and bordered by rocks, with an occasional stretch of sandy beach. At a mile off shore the average depth of water is 20 fathoms. The bay is at the western termination of a high, bold, wooded ridge, running parallel to the shore, with an almost perpendicular water face, and falling away rapidly in-shore. This ridge is about 1000 feet high and 7 miles long;—its western extremity lies E. $\frac{1}{2}$ S. 16 miles from Waaddah island, and is called Slip point; its eastern is designated Pillar point. The width of the bay from Sekou point to Slip point is 2 miles, and the bearing E. by N. $\frac{1}{2}$ N. Outside these limits is a depth of 15 fathoms; in about the middle of the bay the depth is 6 fathoms. Into it empties a small stream from the south-eastward, having low land on its eastern side, and a small rise on the west. Some sunken rocks are said to lie off Slip point.

Callam bay is quite open to all winds from northward and north-westward, and is consequently only safe during the prevalence of those from southward and south-eastward. The usual anchorage is in 8 to 6 fathoms. It must be considered only as a temporary stopping place.

The water along the face of the ridge (just mentioned) is very deep, and the bottom rocky and irregular.

Pillar Point is in lat. $48^{\circ} 18'$, and nearly 23 miles E. $\frac{1}{2}$ S. from the north end of Waaddah island. This point is named Pillar point from the circumstance that it terminates in a bare columnar-shaped rock, slightly separated from the main ridge by a depression; it is consequently a rather remarkable object, where from the character of the country, generally thickly wooded from summit to water line, few objects present themselves by which vessels may accurately fix their position. From this point the shore trends S.S.E. about a mile, and receives a stream coming from the westward, called Canel river. An Indian village exists here. The Indian name of the stream is Pisht-et.

From Pillar point the next prominent object is a wooded hill called Striped peak, bearing E. by N., and distant 17 miles. Within this distance the shore retreats to the southward of this line of bearing (E. by N.) about 3 miles, having alternate bluff and low shores with many little streams opening upon them, and at 11 or 12 miles from Pillar point is Low point, at the mouth of a stream called the Lyro.† Rocks abound close along the shore. The kelp generally extends out to 5 fathoms, and the average depth of water, a mile off, is 10 fathoms. One mile before reaching the western part

* This rock shut in with the south-east end of Waaddah island is said to clear the rocks extending from Kotlah point.

† The Indian name of the river is Kwa-ha-mish.

of Striped peak is a sunken rock, upon which the sea breaks at low water.* A slight indentation of the shore here has received the name of Crescent bay.

Striped peak is several hundred feet high, and wooded; the base of the hill towards the water presents a straight line, running E. by N. for 3 miles, with deep water off it.

FRESHWATER BAY.—The eastern part of Striped peak forms the western boundary of Freshwater bay; it is named Observatory point, and has several rocks off it. The eastern side of the bay is the low delta called Angelos point, at the mouth of the river Elwha, and the two points are distant from each other 3 miles in an E. by N. $\frac{3}{4}$ N. direction. Inside of this line the depth of the curve is about $1\frac{1}{4}$ miles, with water ranging from 16 fathoms in the middle to 4 or 5 close in-shore. The western shore of the bay is bluff, the eastern low, with bluff in the rear. The waters of the Elwha bring down such quantities of earth that a depth of only 10 fathoms is found at a distance of three-quarters of a mile from its mouth.†

Freshwater bay, being quite open to all winds from northward, should only be used as a temporary stopping place. It is usual to anchor in 9 to 6 fathoms.

PORT ANGELOS.—At 4 miles eastward of the river Elwha commences a long, low, very narrow sand-spit, stretching out from the bluff in a general E.N.E. direction for 3 miles, to the point known as Ediz hook, which lies $1\frac{1}{4}$ miles off the main, thus forming an excellent and extensive harbour, with deep water of 25 to 30 fathoms, sandy bottom, close under the inside of the sand-spit, almost to the head of the bay. Through the centre of the bay the surveyors say they "found a line of 15 fathoms, sticky bottom, and between that and the main it shoals very regularly with the same kind of bottom." On the outside of the spit very deep water is found close to it, and the hook may be rounded within a cable's length in 25 fathoms. In the indentation between Angelos point and the head of the bay the water is shoal, 10 fathoms being found at 2 miles from shore.‡

* This rock is the only known detached sunken danger off the southern coast of the strait, with the exception of a rock 11 feet under water, a short distance from the land, at about $6\frac{1}{4}$ miles westward from the lighthouse on New Dungeness. Westward of it some kelp grows a short distance from the beach on the somewhat sheltered part between Striped peak and Pillar point, and here the depth of water at a mile from the shore varies from 8 to 16 fathoms; westward of Pillar point it deepens to 40 fathoms at that distance.

† At the time of the survey, this river had two mouths, but as it runs for some distance close to the beach, it is likely that the position and number of these entrances depend very much upon the melting of the snow, and from other sources of supply in the Angelos valley, whence this river flows. From Angelos point, the hills recede, and leave a level space between them and the coast; thence they rise suddenly to a great height, their summits capped with snow, even in summer, forming some of the highest peaks of the mount Olympus range. The most conspicuous break in these mountains is a deep and narrow valley abreast this point, called Angelos valley, whence, as before remarked, the river Elwha flows in a good sized stream, having sufficient water to admit boats. The whole of this country is covered with fine wood, and abounds in deer and other game, but it is difficult to penetrate, from the underwood and fallen trees. There are several Indian lodges on and near the coast.

‡ It may be remarked here that, in every instance these remarkable shingle spits are thrown out in the direction of the flood stream, and it is probable that this is a rule which obtains in every part of the world, for wherever a shingle spit is thrown out, it generally takes the direction of the flood stream, let the prevailing winds be what they may. This circumstance may be a useful hint, in the construction of works for preventing the growth of shingle spits.

The hook is covered with coarse grass, and in many places with driftwood, showing that the sea sometimes washes over it; it is so low that at a distance it can only be distinguished by its lighthouse. At the head of the bay is a large salt-water lagoon. Fresh water is found on the south shore in several places, but the extensive flats render it hard to obtain. The bluff, 70 feet high, comes directly to the high-water line, and is covered with trees. Three Indian villages of the Clallums* existed on its shores in 1852.

Light.—Near the eastern extremity of Ediz hook is a lighthouse, which exhibits a *fixed white* light, visible 12 miles. The tower is square, painted white, rising from the keeper's dwelling. Its geographical position is lat. $48^{\circ} 8' 21''$, long. $123^{\circ} 24' 7''$.

Coal of fair quality is reported to have been found within 8 miles of port Angeles.

Captain G. H. Richards, R.N., says—"Ediz hook curves from a high bluff in an E.N.E. direction for nearly 8 miles, and forms a large and good harbour. On the north or spit side the water is deep, varying from 15 to 30 fathoms; but southward of a line drawn through the centre there is excellent anchorage in from 7 to 10 fathoms in any part of the port. The outer part of the spit is steep and may be closely rounded, after which the port extends for $2\frac{1}{2}$ miles in a westerly direction, by more than a mile in breadth. Although open to easterly winds, they do not blow home."

THE COAST.—From the extremity of Ediz hook to the lighthouse on New Dungeness the bearing is N.E. by E. and distance $12\frac{1}{2}$ miles, being a chord of a large but not a deep bay. From the Indian lodges abreast the entrance of port Angeles to Green point the bearing is N.E. by E. $\frac{3}{4}$ E. and distance 5 miles; this coast is composed of high sandstone cliffs, mostly bare. With reference to port Angeles, it will be seen that the cliffs on both sides are for the most part bare of trees, and composed of white sandstone; whilst those within the harbour are nearly covered with trees, and thus form a dark break or interval in the white line of cliff, which is easily distinguished from seaward. At 2 miles from the lodges there is a break in the cliff, where a small river or brook finds its way to the beach; an Indian lodge is close to it. The beach is mostly shingle and sand, but at low water the flat portion as well as all the salient points are found to consist of Boulder stones; this is particularly the case at Green point, where another small stream runs out, and a break in the cliff affords access to the country by means of a narrow valley. From Green point to the bight or turn of the bay, which is marked by another break in the cliff, the bearing is N.E. by E. $\frac{3}{4}$ E. and distance $2\frac{1}{2}$ miles; this part of the coast makes a sweep or bend, and is formed of the same high inaccessible sandstone cliffs, as before described, and it may be remarked here that they preserve this character all the way to the turn of the Dungeness cliffs, and that there is but one break in them.

At high water spring tides, the sea washes the foot of these cliffs, but as the water recedes, a road is formed by the fine sandy beach, which the Indians and wild animals prefer to forcing their way through the thick forest above them. At $1\frac{1}{2}$ miles

* The tribes now generally but erroneously known by this name call themselves the Nus-klai-yum; they occupy the American side of the strait from the O'ke-ho, 18 miles from Neé-ah bay.

N.E. by E. from Green point, and half a mile from the beach, lies a sunken rock, having only 11 feet on it at low water, but 6 to 10 fathoms all round; it is well marked by kelp, and only lies in the way of vessels working up under the lee of New Dungeness. From the before mentioned bight or break in the cliff, the coast runs north-easterly for $4\frac{1}{2}$ miles; of this only 2 miles are cliff, for it then makes a sudden bend to eastward for $2\frac{1}{2}$ miles, forming the base of the long curved Dungeness spit, which commences at the spot where the cliffs turn, and where they become less steep, and are clothed with trees. From the termination of the above straight line, the spit sweeps round, and runs N. 40° E. $1\frac{1}{2}$ miles to the point. The whole of this spit is composed of shingle and sand, and is very narrow, except at the northern apex of the interior lake, where the junction of the inner and outer coast lines forms a broader and higher belt. With this exception, when the tides are high and a strong westerly wind is blowing, the sea washes over the whole of it, covering its summit with abundance of drift wood, amongst which are some very large trees.

Within a supposed line connecting Ediz hook and New Dungeness, the soundings are regular, shoaling from 18 and 25 fathoms to 5 and 3 fathoms, the latter being at a quarter of a mile from the beach. Outside the line the soundings increase very gradually to 80 or 90 fathoms, but abreast the turn in the spit the deep water approaches very close, and continues to do so up to the shoal that runs from the end of it, as much as 50 fathoms being found at less than one-third of a mile from the beach.

In easterly winds, anchorage may be had in this bay, but it is too much exposed to westerly and north-westerly winds to be recommended.

From the extreme end of Dungeness point, a shoal extends in a north-easterly direction nearly half a mile, having only 2 to $2\frac{3}{4}$ fathoms over it at low water spring tides. It is narrow, but very steep, the lead falling almost at once from 5 or 6 fathoms just off its extremity into 20 to 30 fathoms; therefore, when hauling round the point, be careful to give this shoal a wide berth, as the tide sets over it with considerable strength, causing a strong overfall, and in bad weather a very nasty sea.

NEW DUNGENESS BAY.—The spit just described encloses a large space available for anchorage, where shelter may be found from any winds, from North, round by the west, to S.E., in from 5 to 10 fathoms, and even with the wind at S.E.; this space is known as New Dungeness bay. The land immediately eastward of the bay around port Discovery and Protection island prevents any great sea, which is consequently not felt till the wind gets about East. The bottom is stiff mud, forming a very tenacious holding-ground, and there is but little tide. Very good water may be had in a cove at the bottom of the bay close to the entrance of the lagoon. At low tide, however, the flat which fills up this bight and extends some distance out is a great hindrance to a watering-party. When going either up or down the strait, New Dungeness bay is a more convenient place to wait for tide or daylight than port Discovery, or the anchorage under Protection island, as it is more easy of access and egress, and has less depth of water.

The outside of the spit has been described; the inside is precisely similar, except that the beach, which shoals off very gradually, leaves a mud flat, narrow towards the

point, but gradually widening as it sweeps into the bight of the bay, where it extends three-quarters of a mile off the shore, and is mostly dry at low water springs, leaving, however, a very narrow channel into the lagoon. The southern part of the spit, enclosing the lagoon, is of the same character as that outside, but narrower and not so high. The entrance to the lagoon is narrow and choked with shoals, but at high water a small vessel may enter, and find sufficient depth within to float her at low water. The southern side of the entrance is formed by two points or spits, the inner one of which runs out from the east end of the cliff before mentioned, and almost overlaps the North spit. The outer point is the end of a spit of shingle which forms the commencement of the beach that runs to the eastward and makes the coast line in that direction.

Light.—There is a lighthouse, coloured black and white, on the extremity of the sand-spit. It is 89 feet high, and shows a *fixed white* light at 100 feet above the sea; visible 14 miles. Its geographical position is lat. $48^{\circ} 10' 52''$, long. $128^{\circ} 6' 31''$, and from it Race rocks lighthouse bears West, 18 miles; Esquimalt harbour lighthouse, N.W. by W. $\frac{1}{4}$ W., 20 miles; Smith island lighthouse, N. 31° E., $18\frac{1}{2}$ miles; and point Wilson, E. by N., $14\frac{1}{2}$ miles.

Upon the outer extremity of the spit a fog-whistle is established, which gives blasts of 6 and 8 seconds at alternate intervals of 12 and 39 seconds, during foggy weather.

Mr. Davidson, U.S. Coast Survey, thus describes New Dungeness bay:—"The shore from point Angelos gradually curves to the north-eastward, and about 8 or 9 miles from Ediz hook another long, low, narrow sand-spit, covered with grass, leaves the bluff shore and stretches in a general N.N.E. direction for $3\frac{1}{2}$ miles, forming the north-western shore of the roadstead of New Dungeness. On the inside, one mile from the eastern extremity, another narrow sand-spit makes $1\frac{1}{2}$ miles southward towards the main shore, forming a large inner shoal bay, with a narrow opening, through which the water passes, as over a rapid at low tide. Abreast this point is a small stream, affording an abundance of fresh-water but boats must obtain their supply at low tide, and come out when the tide has sufficiently risen. The western side of this stream is a bluff 60 feet high, and upon it is a large village of the Clallams. The eastern shore of the stream is low, swampy, and covered with trees and brush. It forms the southern or main shore of the roadstead, and off it lie extensive mud flats, which are bare at low water for five-eighths of a mile, and run as far as Washington harbour. Shoal water exists some distance outside of these flats. Soundings of about 20 fathoms are found at a quarter of a mile southward of the lighthouse, the depth regularly decreasing across the bay, with a soft, tenacious, muddy bottom. The usual and best anchorage is to bring the lighthouse to bear about N. by E. $\frac{1}{4}$ E., half a mile distant, when 10 fathoms water are found at one-third of a mile off the beach. With the lighthouse bearing N.W. by N. three-quarters of a mile distant, the same depth and bottom are found. The nearest shore will bear South $1\frac{1}{2}$ miles, and the mud flat three-quarters of a mile in the same direction. A south-east wind drawing out of the strait blows directly into this harbour, but the bottom will hold any vessel with good ground tackle. The only difficulty will be to get the anchors out of the mud after riding a couple of days to a gale. In the last position a vessel can readily get under way and clear the point.

A shoal with 2½ fathoms makes out from the end of the point for half a mile, and a heavy tide-rip runs over it at the change of the currents.

Tides.—The approximate corrected establishment is 8h. 3m.; the mean rise and fall of tides is about 5 feet."

From New Dungeness harbour the coast trends in an E. by N. direction 14½ miles to Wilson point on the east side of the entrance to Admiralty inlet, the channel leading to Puget sound. Within this space are Washington and Discovery harbours, of which the latter is the easternmost.

Washington Harbour.—From New Dungeness roadstead to the entrance of this harbour the immediate shore is low, flat, covered with trees, and bordered by an extensive mud flat; but behind it, at a very short distance, rises a level plateau. The bluff at the N.E. point of the harbour is seen from Dungeness point. The entrance to the harbour is nearly closed by a low sand spit stretching across it from the east almost to the west coast, where a narrow channel way exits having a depth of 2 fathoms through it; this cannot be seen from Dungeness point, which is 6½ miles from it in a N.W. direction, on account of the outward curving of the intermediate shore. Inside of this spit are soundings of 17 fathoms shoaling to 3 fathoms as the head of the harbour is approached. The width of the harbour is a little over a mile, and its length is about 3 miles; its general direction is S.E. by S. The depth at a mile outside of the sand spit is 10 to 12 fathoms, deepening rapidly to 30 and 35, with a bottom of stiff mud. The Indian name of the bay is S'quim, by which it is generally known to the settlers.

Protection Island.—The western extremity of this island lies E. ½ S., distant 7½ miles from Dungeness lighthouse, whence it extends 1½ miles N.E. ½ E.; it is a narrow island, curved outward to the strait, and having a low point at each end, with shoal water stretching from the western. Its sides are very steep, and about 200 feet high, the seaward part covered with timber, and that towards port Discovery undulating and covered with fern. It lies 2 miles directly off (N.W.) the entrance to port Discovery. Southward of it is very deep water, but northward or outside it a line of kelp, about half a mile out, marks the 4-fathom curve, and from this a bank runs out N.N.W. for 3 miles, having from 5 to 15 fathoms upon it, with a shoal spot of 3 and 4 fathoms at about 2 miles from the island. Upon this bank, named Dallas bank, is good anchorage with light airs and strong adverse currents; the bottom is irregular and falls off suddenly.

Protection island, with ports Angeles and New Dungeness, affords the first examples of the peculiar feature of low, sandy, and gravelly points covered with coarse grass and bushes, making out from the high cliffs, where the tendency of strong currents would seem to be to cut them off.

It was called Protection island by Vancouver in 1792, and on account of its position in relation to port Discovery is very aptly named.

PORT DISCOVERY.—From Dungeness light the west side of the entrance to port Discovery, called Challam point, bears E. by S. ½ S., distant 9 miles. From Washington harbour the distance is 4 miles;—the intermediate shore is composed of high steep cliffs. Cape George, the eastern point of the entrance, bears N.E. ½ E. 1½ miles

from Challam point, and is a steep bluff rising directly from the water. The average width of the bay is nearly $1\frac{1}{2}$ miles for 9 miles of its length, and then decreases rapidly to the Salmon river at its head. It makes four general courses from the entrance to the head, as follows: $1\frac{1}{2}$ miles South, 4 miles E. by S. $\frac{1}{2}$ S., $2\frac{1}{2}$ miles S. by E., and $1\frac{1}{2}$ miles S.W. by S. The shores are abrupt, and covered with wood to their edges, and the projecting parts are all terminated by low points stretching out short distances. On the second point, on the eastern side, were the remains of an extensive stockaded village of the Clallums in 1856. Mount Chatham lies off the south-western part of the bay, and reaches a height of 2100 feet.

When well in this bay Protection island so completely shuts up the entrance as to make it appear as a large lake. The great drawback to this port is the depth of water, which in mid-channel is not less in any place than 25 fathoms, and in some is 40 fathoms. Under the second low point on the east side the surveyors could not find less than 25 fathoms at a few ship's lengths from the beach, but found good anchorage in 20 fathoms, soft bottom, on the western shore, 2 miles S.S.E. from Challam point, and abreast of a low swampy beach.

Vancouver says "The projecting points in port Discovery usually acquire a form somewhat circular, though irregular; and, in general, are nearly steep-to, extending from the cliffy woodland country, from 100 to 600 yards towards the water's edge, and are composed of a loose sandy soil. The surface of some was almost entirely occupied by a lagoon of salt water, or brackish swamp; others were perfectly dry; not one of them produced any trees; but were mostly covered with a coarse spiry grass, interspersed with strawberries, two or three species of clover, samphire, and a great variety of other small plants, some of which bore very beautiful flowers. On a few of the points were some shrubs that seemed to thrive excessively, such as roses, a species of sweet-briar, gooseberries, raspberries, currants, and other small bushes, which in their respective seasons, produce most probably the several fruits common to this and the opposite side of America. These all appeared to grow very luxuriantly; and from the quantity of blossoms with which they were loaded, there is great reason to believe them very productive.

We had little trouble in clearing a sufficient space for our encampment, which was commodiously situated, close to the north side of the stream or brook. In my excursion up the harbour, I found that it extended about 4 miles from the ship, and then terminated in a muddy flat across its head, about a quarter of a mile from the shore. The water, which was 7 fathoms deep close to the flat, gradually deepened to 10, 20, and 30 fathoms, good holding ground. On this bank were found some small indifferent oysters. The shores beyond it are low and thickly wooded, and through them there appeared to run a very considerable stream of water, with several smaller ones, emptying themselves into the harbour. The back country had the appearance of a swampy fen for a considerable distance. We landed not far from the largest rivulet, where we found a deserted village, capable of containing about 100 inhabitants."

If port Discovery lies under any disadvantage it is its great depth of water; but the bottom is excellent holding-ground, and free from rocks. Towards the upper part of the harbour it decreases in depth, and there is perhaps not a more eligible spot for

riding than off the first low sandy point on the western shore, about 4½ miles from the entrance; here Vancouver anchored, and obtained supplies of wood and water. The country in the neighbourhood of the port is of moderate height, although bounded on the west side by mountains covered with snow, to which the land from the water's edge rises, in a pleasing diversity, by hills of gradual ascent. The snow on these hills probably dissolves as the summer advances, for pine trees are produced on their very summits. On the sea shore the land generally terminates in low sandy cliffs; though in some spaces of considerable extent it runs nearly level from high water mark. There are few places where the variety and beauty of the flowers are so great as they are here; the general character of the soil around this harbour is a thin, black, vegetable mould, with a substratum of sand and gravel. The vigour and luxuriance of its productions prove it to be a rich fertile mould, which might possibly be considerably improved by the addition of the calcareous matter contained in the marrow-stone that presents itself in many places. The trees grow so closely, that in some places the woods are almost impenetrable. The timber consists principally of pine, fir, and spruce. Of the latter there are two species, one of which resembles the hemlock-spruce of the United States; it has a very tall growth, and puts out but few; and those but small, lateral branches. Some maple-trees grow in the open ground and on the banks, but they are too small to be of any service to the settler.

Port Discovery was visited in 1841, by Com. Wilkes, U.S. Navy, who remarks:—"After passing Protection island, an extensive bay opened, on the shores of which we saw the long poles mentioned by Vancouver, and represented in his book. The use of these he was unable to discover, but the Indians informed us that they were for the purpose of suspending nets for taking the wild-fowl that frequent these shores in great numbers.

The description of Vancouver is so exactly applicable to the present state of this port, that it was difficult to believe that almost half a century had elapsed since it was written. The beautiful woods and lawns of Protection island, in particular, exist unchanged. The lawns still produce the same beautiful flowers and shrubs, and though closely surrounded by dense woods, do not seem to have been encroached upon by their luxuriant growth, although there is no apparent reason why it should not, long ere this, have overrun them.

The name of port Discovery was given by Vancouver. Protection island covers it completely to the north, and would render it easily defensive against the most formidable attack. The only objection to it as a harbour is the great depth of the water, which in the middle is nowhere less than 40 or 50 fathoms, and is often as much as 16 fathoms close to the shore.

Point Wilson and Light.—At about 6 miles eastward from port Discovery is point Wilson, the western point of the entrance to Admiralty inlet. From Dungeness light it bears E. by N., distant nearly 15 miles, this course passing over the outer edge of the 8-fathom shoal (Dallas bank) off Protection island. The extremity of the point is composed of low sandy hillocks, covered with coarse grass; but west of it the hill rises 200 or 800 feet, and again falls inshore.

The lighthouse, painted white, on the point, exhibits a *fixed white light*, at 53 feet

above the sea, visible 12 miles. A fog-whistle gives blasts of 8 seconds duration at intervals of 52 seconds. The geographical position of the lighthouse is lat. $48^{\circ} 8' 41''$, long. $122^{\circ} 45' 5''$.

Between point Wilson and port Discovery the shore is high, with steep yellow cliffs, and about midway a slightly projecting angle is formed, called Middle point. To the north-west of the point 15 fathoms can be obtained a mile from the shore, but the water shoals suddenly, and when running in a fog the lead must be kept going. Off the eastern end of the point 20 fathoms can be got at a ship's length from shore. During ebb tides a very strong eddy current sets to the eastward along shore between port Discovery and point Wilson. The surveyors state that "in 1855, when coming out of the inlet on the large ebb, with scarcely any wind, we kept outside of the rip showing the line of the eddy. A vessel 2 or 3 miles ahead was in the eddy at the same time. We were carried past Protection island, but she was drifted back to point Wilson. The Indians when bound to Dungeness keep well out in the ebb."

The country between ports Discovery and Townshend, of which point Wilson is the northern extremity, consists of a peninsula 8 miles in breadth and 10 miles in length, offering great advantages as a location for a town. It is known as Quimper peninsula.

NORTH SHORE OF THE STRAIT TO CHATHAM ISLANDS.

From point Bonilla to Owen point, the western head of the entrance to San Juan bay, the shore runs 18 miles in an E. $\frac{1}{2}$ N. direction. It is nearly straight, rocky, and bluff, with high mountains rising immediately behind it, and all heavily wooded. A depth of 10 to 20 fathoms is found within half a mile of the shore. Vessels are apt to lose much of the wind when close under either shore of the strait, and at present it is impossible to say where the strongest currents run.

SAN JUAN BAY.—This is the first bay on the north side of Juan de Fuca strait eastward of Bonilla point. It is a good roadstead with all winds from the land, but not with those from south-westward as it is quite exposed to that quarter, and when the wind blows with any strength in the offing a heavy sea is sent in. Although the swell can generally be avoided to some extent by anchoring well within the bay, at a moderate distance from either side, it is not considered advisable to remain when there is an indication of the wind veering to the south-westward, but to weigh immediately and seek shelter either in Neé-ah harbour or in some convenient bay within the strait. Neé-ah harbour bears S. by W. $10\frac{1}{2}$ miles from this bay.

Port San Juan can be recognised from a considerable distance, in consequence of the opening making as a deep gap between two mountain ranges.* From the lighthouse on Tatoosh island (cape Classet), the entrance bears N.N.E. $\frac{1}{2}$ E. The light is visible from the anchorage, and is of service to vessels entering or leaving the bay.

* Mr. Davidson, U.S. Coast Survey, says "The sides of port San Juan are steep, high, and backed by heavily timbered hills and mountains. At a distance in very clear weather it is difficult to distinguish the entrance unless one is acquainted with the locality, but in moderately hazy weather the indentation is readily made out. When steering up the bay a mid-channel course clears everything well."

The *west* point of port San Juan is known as point Owen. It has some rocks about it, and a low flat rock, named Owen island, lies off it at rather more than a cable's length; this island is awash at high water, and at a very short distance from its south side is a depth of 8 fathoms. Within the bay, on the west side, are other rocks and broken ground to the distance of about a mile from Owen island; and extending out 2 cables from shore. The outermost of the rocks is a small patch awash at low tide situated N.E. $\frac{1}{2}$ E., 4 cables from Owen island, and as much as $2\frac{1}{2}$ cables from shore; as there is a depth of 4 fathoms, rapidly deepening to 6 and 7 fathoms, close to this rock, it requires some care to avoid.

The *east* point of port San Juan is about $1\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from the west point, and is readily known by the Observatory rocks (some high pinnacles having a few trees growing on them, and about and around which are other rocks) a short distance off it. At nearly half a mile northward from these rocks, and on the same side of the bay, a reef, partly above water and named Hammond rocks, extends out from the shore $1\frac{1}{2}$ cables.

From the entrance the bay runs nearly $8\frac{1}{2}$ miles in a N.E. by N. direction, and maintains throughout a breadth of $1\frac{1}{2}$ miles. Its head consists of a beach of muddy sand, at the north end of which is Gordon river, and at the southern end Cooper inlet; these streams are sufficiently deep at high water to permit the entrance of vessels of light draught. On the south bank of the river Gordon is an Indian village named Onismah.

The soundings at the entrance to port San Juan, midway between Owen island and Observatory rocks, are 18 to 11 fathoms. From this depth they gradually decrease towards its head, where at one-third of a mile from the beach is a depth of 14 to 17 feet; in this latter part the sea breaks during heavy gales. A swell usually prevails in the entrance. Throughout the bay the bottom consists of fine muddy sand.

The usual place of anchorage is in 7 to 6 fathoms at about $1\frac{1}{2}$ miles from the head of the bay, with Owen island bearing S.W. and Adze head (the second projecting point of the east shore, from Hammond reef) E.S.E.

The approximate geographical position of Observatory rocks is lat. $48^{\circ} 31' 30''$, long. $124^{\circ} 28' 15''$.

The COAST.—From port San Juan the shore of Vancouver island trends East 24 miles to Sherringham point, and presents no very remarkable features; the country is thickly wooded, and the land rises to a considerable elevation. At 8 miles eastward of port San Juan is Providence cove, a small inlet only fit for boats; and at the distance of 7 miles farther eastward, in a small bight, is a stream named Sombrio river. The river Jordan, a considerable stream, is $18\frac{1}{2}$ miles eastward from port San Juan, and $5\frac{1}{2}$ miles westward from Sherringham point. The soundings off this coast so far as Sombrio river are deep and not very regular, being from 16 to 20 fathoms at a mile from the shore, then suddenly dropping into 50 and 60 fathoms. Between Sombrio river and the river Jordan the depth is 7 to 10 fathoms at a mile from the land; off the latter river the depth of 10 fathoms extends farther out than 2 miles. At a mile southward from Sherringham point are soundings of 40 to 50 fathoms.

Eastward of Sherringham point the shore curves a little to the northward, and at a

distance of $4\frac{1}{2}$ miles in an E. $\frac{1}{2}$ N. direction is Otter point. From Otter point the entrance to Sooke inlet is E. by N. $\frac{1}{2}$ N., distant $3\frac{1}{2}$ miles, the intervening coast forming rather a deep indentation named Sooke bay, in which vessels may anchor in fine weather at rather more than half a mile from the shore in 8 fathoms. Generally speaking the projecting points on the north side of the strait are not remarkable nor easily distinguished unless viewed from close in shore; some of their extremes are partially bare of trees. Vessels running or working up the strait at night should be careful not to get so near the north shore as to shut in Race island light by Beechey head.

SOOKE INLET.—This is a narrow channel, $8\frac{1}{2}$ miles long, leading into a wide basin 2 miles in extent, which is perfectly landlocked, and has a depth of 10 to 15 fathoms. The inlet is difficult to navigate, on account of its winding direction. On its northern side the water is shallow, and sends off several spits of shingle, one of which joins Whiffin island, so that the entrance is limited to a few yards in width. The depth is from 8 to 9 fathoms, and the course in is along the eastern shore; but such is the strength of the tides, and the intricacy of the channel, that it is recommended not to attempt to enter without a pilot.

Vessels may anchor in 10 fathoms at half a mile outside the entrance of Sooke inlet, and, if necessary for shelter, may with a fair wind run inside Whiffin island, where there is sufficient space to anchor.

Whiffin island is low, gravelly, and as already noticed is always connected with the western shore of the inlet. Its eastern point (bearing N.N.E. distant three-quarters of a mile from the centre, between the two entrance points) must be rounded close, leaving it on the port hand, as a reef lies only half a cable eastward from it. On rounding the point drop the anchor at a cable's length within in 8 fathoms; here there is a space of deep water 2 cables in extent.

From the depth of 10 fathoms outside the entrance to Sooke inlet a high hill on the eastern side of the inlet, named mount Maguire, will bear about N.E. It is partially covered with trees, but the bare rock shows distinctly in many places, and this feature now commences to distinguish the south-east part of Vancouver island. The shore in many places is bare and rocky, with patches of land covered with fern and destitute of trees, and the houses of settlers begin to appear.

Secretary Island.—On the eastern side of Sooke inlet, and at $1\frac{1}{2}$ cables from the coast, is Secretary island, a small, but bold rocky islet, separated from the shore by soundings of 15 to 16 fathoms. Its approximate geographical position is lat. $48^{\circ} 19' 35''$, long. $123^{\circ} 42' 40''$.* The depth at $1\frac{1}{2}$ miles southward of it is 80 to 90 fathoms.

Beecher Bay.—From Secretary island to Beechey head, the west point of entrance to Beecher bay, the distance is $2\frac{1}{2}$ miles in an E. $\frac{1}{2}$ S. direction. The shore between is bold and steep, and has deep water almost close to it. The head, a bold wooded cliff, has soundings of 40 to 50 fathoms immediately off it; around it the currents have very great strength, hence more than ordinary care is required when seeking anchorage in

* Dependent upon Duntze head, Esquimalt harbour, being in long. $123^{\circ} 26' 45''$. The Indian name of the inlet is T'sok.

Becher bay.† When bound eastward through the strait, the land about this headland should have a berth of 2 miles if it is intended to pass southward of Race islands. The approximate geographical position of the head is lat. $48^{\circ} 18' 30''$, long. $128^{\circ} 39' 27''$.*

Becher bay has an extent of $1\frac{1}{2}$ miles. Its east point, cape Church, is distant from Beechey head $2\frac{1}{2}$ miles in an E. by N. $\frac{1}{2}$ N. direction. The bay, as an anchorage, cannot be recommended, as it is open and exposed to the full force of southerly winds. About and around it are high rocky hills, and even in fine weather inconvenience is occasioned by the strong gusts which descend from the mountains; vessels bound westward through the strait and meeting with a southerly wind are therefore recommended to seek in preference the anchorage in Parry bay, as they will then be sheltered from heavy seas by Race islands.

Off cape Church are three rocky islets, of which the outermost bears the name of Church island; this has a depth of 9 fathoms close to it, rapidly deepening to 25 and 40 fathoms, the latter being at about one-third of a mile from it. Westward of these, and on the eastern side of the bay, are several small wooded islands, called the Bedford islands. Within the bay are Frazer and Wolfe islands, with some small islets about them; the easternmost and largest island is that named Frazer,—the westernmost is Wolfe island. Some small islets also lie in the eastern part of the bay, close to the shore.

The depth at the entrance to Becher bay, midway between Bedford islands and the western shore, is 50 to 40 fathoms on a rocky and irregular bottom; thence it gradually decreases to 9 and 6 fathoms at its head. The passage in is between Frazer and Wolfe islands and is 4 cables wide. From these islands the course to the anchorage is north-easterly about three-quarters of a mile. The usual place of anchorage is at about a quarter of a mile N.N.E. from the centre of Frazer island in 10 fathoms water.

Bentinck Island.—From Becher bay to Bentinck island, off the south-easternmost part of Vancouver island, the coast trends irregularly $2\frac{1}{2}$ miles. This island is rather more than half a mile in extent, is about 100 feet high, and, like the adjacent land, covered with pine trees; its southern and eastern sides are fringed with kelp, outside of which it is believed there are no sunken dangers. Its shape is very irregular, as it is almost divided in the middle.

The narrow channel between Bentinck island and the shore is so thickly strewn with rocks as to be scarcely navigable; it is however sometimes traversed by boats. Coasters who are well acquainted with the locality occasionally anchor in the eastern entrance to this channel, and obtain shelter from southerly winds. The currents hereabout have great strength, and also run through the passage with considerable velocity.

Race Islands and Light.—These are a cluster of low rocky islets, situated a short distance south-eastward of Bentinck island. The outermost and largest islet is 5 miles E. by N. from Beechey head, and one mile S.E. from Bentinck island. The extent of

† "The currents go by Beechey head with a rush. In this vicinity, we recollect the instance of a United States revenue cutter striking the bold shore with her flying jib-boom, and only striking her forefoot after the jib-boom had been carried away." Mr. Davidson, U.S. Coast Survey.

* See note at foot of page 288.

the group is rather more than half a mile north and south, and the same east and west, and all the islets are bare of trees or bushes. The bottom for about half a mile from them in a south-easterly direction is irregular, with points of rock in 5 fathoms. The tides among them run from 8 to 6 knots per hour, and during bad weather heavy and dangerous races occur. In light winds the islands should have a good berth, especially when eastward of them, as the ebb sets strongly towards them.

The outermost, or Great Race islet, is $1\frac{1}{4}$ cables in extent, and 25 feet high. It should always have a berth given to it of about a mile, at which distance is a depth of from 40 to 50 fathoms; it may, however, be rounded at a less distance, the outermost danger from it, the Rosedale rock, 5 feet under water, being nearly half a mile from it in a S.E. by E. direction.

The lighthouse on the Great Race islet consists of a stone tower, painted with alternate horizontal black and white bands. It exhibits at 118 feet above the sea, a light flashing every 10 seconds, visible 18 miles. Its approximate geographical position is lat. $48^{\circ} 17' 80''$, long. $129^{\circ} 32' 15''$. From it, the light at Esquimalt harbour bears North, distant $8\frac{1}{4}$ miles; entrance to Victoria harbour N. by E. $\frac{1}{4}$ E., 9 miles; Discovery island N.E. by N., 15 miles; Smith island light N.E. by E. $\frac{1}{4}$ E., $26\frac{1}{2}$ miles; and New Dungeness light East, 18 miles. Attached to the lighthouse is a fog-bell.

The channel between Bertinck island and Race islets is nearly half a mile wide, and with the exception of some rocks (covered at high water) at a cable westward of the north islet, is believed to be free from danger; its least depth is 14 fathoms. This passage may be taken by a steamer; but it is not recommended for a sailing vessel under ordinary circumstances, on account of the strength of the tides, and races caused by the irregular rocky bottom. The course through is N.N.E. and S.S.W.

Pedder Bay.—Immediately northward of Bertinck island is Pedder bay, an inlet having an extent of nearly 2 miles in a W.N.W. direction. It is about three-quarters of a mile wide at the entrance, where is a depth of 13 to 7 fathoms, and decreases rapidly in width and depth towards its head; its western part is consequently only available for vessels of light draught. As this bay is quite exposed to easterly winds, it should only be frequented when the wind is from southward and westward; it is a convenient stopping place for awaiting the turn of the tide off Race islets.

The usual place of anchorage is in 7 fathoms with cape Calver, the south point of the bay, bearing S.E. by S., distant about half a mile. The holding ground is good. Close to the cape is a small patch of 8 fathoms.

In the narrow part of the bay is a depth of 4 to 2 fathoms, and this gradually decreases to 7 feet at its head. The upper part of the bay is therefore rarely visited except by boats.

Parry Bay.—Immediately northward of William head, the north point of Pedder bay, is Parry bay, an open roadstead facing the east. Its north point, Albert head, is moderately high and slopes to the sea, it is also bare of trees at its extremity, but wooded immediately behind; at a cable from it is a reef. William head somewhat resembles it, but is lower. The depth off these headlands is too great for anchorage.

The soundings in Parry bay gradually decrease from 20 fathoms at three-quarters of a mile from the shore, to 6 and 5 fathoms at $1\frac{1}{4}$ cables from the beach. The usual

anchorage is in 9 fathoms with William head bearing S.W. by S., distant from half to three-quarters of a mile. With a south-easterly wind there is ample room to get under way, which a vessel should immediately do, and if not able to round Race islands, and proceed to sea, should run for Esquimalt harbour.

The shelter in Parry bay is from westerly winds, and the ground holds well. All winds from eastward, between North and S.E., blow directly in.

ESQUIMALT HARBOUR.—From Albert head the coast trends northward nearly 8 miles to Esquimalt harbour, the space between forming what is known as Royal roads. Here vessels may anchor in 10 to 12 fathoms, at about three-quarters of a mile from the shore, and find good shelter from all winds except those from eastward and south-eastward. A berth that is recommended is at about a mile S.S.E. $\frac{1}{2}$ E. from Fisgard light, as the harbour will then be open and can be entered if necessary.

Light.—The lighthouse on Fisgard island, on the western side of entrance to Esquimalt harbour, shows a *fixed* light at 65 feet above the sea, visible 10 miles. The light shows *white* between the bearings from it of S. $\frac{1}{4}$ E., easterly, to S.E. by E. $\frac{1}{4}$ E., and *red* from S.E. by E. $\frac{1}{4}$ E. easterly and northerly to N. by W. $\frac{1}{4}$ W.; hence when approaching the harbour a vessel is in safety so long as the white light is visible.

"Esquimalt harbour* is a safe and excellent anchorage for ships of any size, and with the aid of the light on Fisgard island may be entered at all times with great facility. The entrance, which bears North $8\frac{1}{2}$ miles from the lighthouse on Great Race island, is between Fisgard island and Duntze head, and is 3 cables in breadth, opening out immediately within.

The only dangers are the Scrogg rocks which lie on the eastern side, S.S.E. 3 cables from Duntze head, and cover at three-quarters flood. Inskip islands kept well open of the head leads clear to the westward of them, but the best mark for entering with a leading wind is Thetis cottage, a conspicuous white building on Dyke point, just open of the western Inskip rock, bearing N. by W. $\frac{1}{4}$ W., which leads in mid-channel.

Fisgard island should not be passed within a less distance than one cable, keeping just without the kelp, which extends about half a cable eastward of it, for a rock with 7 feet water over it lies three-quarters of a cable north-east of the lighthouse.

Vessels entering the harbour at night with a strong wind after them should take care to shorten sail in time, as the space for rounding to is somewhat limited; and it is desirable to moor if any stay is intended, as the winds are changeable.

The best time to leave the harbour is early in the morning, when either a calm or light land wind may be expected; there is little strength of tide in the harbour, or for some distance without, and it sets fairly in and out.

The strongest and most frequent gales blow from S.W. and S.E. which are leading winds in, but rarely from N.W. The S.W. is a summer wind, generally fresh, and brings fine weather, unless it blows a gale. S.E. winds may be looked for during the winter months, or between November and March, and generally a strong gale once in

* The instructions for Esquimalt and Victoria harbours and the coast to Chatham islands are from the Vancouver Island Pilot, 1864.

a month with rain and thick weather. The N.E. wind rarely blows with much strength, and always brings fine clear weather; a direct South wind, to which some parts of the harbour are open, seldom blows, and there is never sufficient swell to render the anchorage inconvenient.

Whale Rock.—The Whale rock, with only 7 feet on it at low water, lies W. $\frac{1}{4}$ N., 2 cables from Inskip islands, or nearly midway between them and the western shore of the harbour. This rock is of small extent, and not marked by kelp; it has a clear passage on either side, that to the eastward being the widest. Yew and Rodd points, just touching, point to the rock; Yew point, just touching the lighthouse on Fisgard island, S. by E. $\frac{1}{4}$ E., leads nearly a cable westward; and when Ashe head is well shut in by Inskip islands, a vessel will be clear to the northward.

Anchorage.—The most convenient anchorage is in Constance cove,* on the eastern side of the harbour, immediately round Duntze head, the general depth being 6 fathoms, and the holding ground good; there is, however, safe anchorage in any part of the harbour, in not less than $4\frac{1}{2}$ fathoms, as far northward as Dyke point. About a cable above this point the water shoals to 3 fathoms, and thence to the head of the harbour is a flat with only a few feet on it at low water.

Thetis cove in Plumper bay, on the eastern side, immediately north of Constance cove, is a snug anchorage, with the harbour entrance just shut in by Inskip rocks, in $4\frac{1}{2}$ fathoms; but vessels proceeding above these dangers must take care to avoid the Whale rock.

Water may be obtained during the winter months without difficulty from the many streams that empty themselves into the different bays, caused by the great quantity of rain which usually falls at that season; but in summer watering is a tedious process, and boats must be sent either to Rowe stream, at the head of the harbour, or to the salt lagoon just outside the entrance. Both offer difficulties unless at or near high water.

Water, however, might be conveyed at all seasons, and at a trifling expense, from the chain of lakes just over the western side of the harbour, near Colwood farm.

VICTORIA HARBOUR is a little more than 2 miles eastward of Esquimalt, with its entrance between Ogden and MacLaughlin points. Macanlay or Sailor point, a remarkable projection nearly midway between the two harbours, is a bare flat point about 80 feet high, showing as a yellow clay cliff, worn by the action of the sea and weather into a rounded nob at the extreme. The coast on either side of this point for a mile is fringed with sunken rocks, and is dangerous for boats in bad weather, many fatal accidents having occurred.

The entrance to this harbour is shoal, narrow, and intricate, and with S.W. or S.E. gales a heavy rolling swell sets on the coast, which renders the anchorage outside unsafe, while vessels of burthen cannot run in for shelter unless at or near high water. Vessels drawing 14 or 15 feet water may, under ordinary circumstances, enter at such times of tide, and ships drawing 17 feet have entered, though only at the top of spring tides.

* The space west of Thetis island, on the southern side of Constance cove, has been enclosed by a double row of piles, to mark the site of the dock in course of construction (1878).

The channel is buoyed,* but it is necessary to take a pilot, and the space is so confined and tortuous that a long ship has considerable difficulty in making the necessary turn; a large per-centage of vessels entering the port, small as well as large, constantly run aground from these causes, or from trying to enter at an improper time of tide, or neglecting to take a pilot. Such accidents, however, are seldom attended with more than delay and inconvenience, as the shoalest and most intricate part of the passage is sheltered; when within, the port is perfectly land-locked, and vessels may lie in 14 to 18 feet at low water, but the harbour accommodation is limited.

Light.—A fixed blue light is exhibited on Berens island, on the west side of the entrance; it is 44 feet above high water, and visible 6 miles. Position, lat. $48^{\circ} 25' 20''$, long. $128^{\circ} 24'$.

Doubtless Victoria harbour is susceptible of improvement by artificial means, though it is improbable that it can ever be made a safe and convenient port of entry for vessels of even moderate tonnage, at all times of tide and weather, and it appears not a little remarkable that with the excellent harbour of Esquimalt within 2 miles, Victoria should have been continued as the commercial port of a rising colony, whose interests cannot but suffer materially from the risks and delays which shipping must encounter in approaching the commercial capital.

Victoria is a free port, the government site, and the largest and most important town in these colonies. It enjoys a considerable foreign and coasting trade, which is annually increasing. The resident population is upwards of 7000, and the town has made great progress since 1868, when it may be said to have sprung into existence; it now covers a large extent of ground, substantial and handsome stone and brick buildings everywhere replacing the wooden structures first erected.

Along the eastern side of the harbour in front of the town there are about 400 yards of fair wharfrage, with a depth of 10 to 16 feet at low water spring tides. Between Songhies† and Limit points, on the opposite side of the harbour, is a small slip capable of receiving vessels of about 200 tons burthen; larger vessels, however, may heave down alongside the wharves.

Supplies.—Provisions of all kinds, and of an excellent quality, may be procured at nearly the same prices as in England, and water is to be had from a floating tank capable of going outside the harbour, the charge for it being about 4s. 2d. per ton. Supplies for refitting and repairing vessels, except timber, are scarce and expensive, but of fair quality. Coals are plentiful, varying in price from 25 to 40 shillings per ton.

Anchorage.—Vessels anchoring outside the harbour to wait for the tide, or from other causes, should not come within a line between Ogden and MacLaughlin points,

* The entrance to Victoria harbour is marked by black buoys on the southern side and red buoys on the northern side.

The buoys marking the northern edge of the shoal extending from Shoal point and Channel rock (lying 100 yards south-west of Pelly island) are of a pyramidal shape, surmounted by a ball. The buoy formerly marking the position of Sleeper rock has been removed (1878).

† *Beaver Rock*, lying E. by S. from Songhies point, distant 150 yards, is in process of removal (1878).

the former being W. $\frac{1}{4}$ N., the latter E. $\frac{1}{4}$ S., midway between, or a quarter of a mile from either; this is a good stopping place with off-shore winds or fine weather, but is by no means recommended as a safe anchorage for sailing vessels during the winter months, when bad weather may be looked for with little warning.

Pilots.—There are three or four pilots attached to the port, who keep a good lookout for vessels off the entrance. Pilotage is compulsory to all merchant vessels, except coasters, but the charges are moderate.

Brotsky Ledge.—About 4 cables from Holland point, and right in the fairway of vessels entering Victoria harbour from the eastward, lies the Brotsky ledge with 5 feet on its shoalest part; it is covered with kelp, and about a cable in extent within the 5-fathom line. There are 9 fathoms between the ledge and the shore.

A conical red bell-buoy is moored $1\frac{1}{2}$ cables S.W. of the 5-foot spot.

Fisgard island lighthouse, the north part of Brothers island, and Macanlay point in line W. $\frac{1}{4}$ N., leads a cable north of the ledge in 9 fathoms, between it and the shore; and the lighthouse, just open southward of Brothers island W. by N. $\frac{1}{4}$ N., leads 2 cables south of the ledge in 21 fathoms.*

General Remarks.—After rounding Race island lighthouse at the distance of a mile, the course for Esquimalt harbour is N. $\frac{1}{4}$ W. $8\frac{1}{2}$ miles. The lighthouse on Fisgard island is very conspicuous, and will be seen immediately on rounding the Race islands; a course direct for it will clear all dangers, but attention must be paid to the set of the tides. The ebb runs almost directly from the Haro and neighbouring straits towards the Race islands, and a sailing vessel unless with a commanding wind should give them a berth of more than a mile, and steer N.E. by N. for 3 or 4 miles, before she bears up for the harbour; the flood sets in the opposite direction to the N.E., and with light winds vessels are liable to be carried to the eastward, and if near to the Vancouver island shore, up Haro channel, where the water is generally too deep for anchorage; therefore with the flood the coast of Parry bay should be kept aboard if possible, where good anchorage may be had in moderate weather and with all westerly winds, less than a mile from the shore in 10 fathoms.

By night, when Fisgard island light bears N. by W., a vessel may steer boldly for it. The only precaution necessary is to keep the white light in full view; if it becomes dim or shaded, she is getting too near the shore, and should immediately haul out to the eastward until it is again distinctly seen; the two lights by their bearings will immediately show a vessel how she is being affected by the tides.

Entering Esquimalt harbour, the Fisgard island light should be left from 1 to 2 cables on the port hand; when it bears N.W. by W. $\frac{1}{4}$ W. the light changes from white to red, and shows the latter colour within the harbour; and when it bears S. by W. at a convenient distance, a vessel may anchor in 7 fathoms, or stand into Constance cove if preferred. The Scrogg rocks on the eastern side of the entrance of the harbour must be avoided; they bear E.S.E. from Fisgard island distant nearly 4 cables. If not desiring to enter the harbour at night, good anchorage may be had in Royal roads in 9 fathoms; Fisgard island light bearing N. by W. from half a mile to a mile.

* The beacons on Beacon hill, formerly used as clearing marks for Brotsky ledge, have been removed (1878).

The entrance to Victoria harbour being only 2 miles eastward of Esquimalt, the same precautions are necessary as regards the tides. The course from a mile off the Race islands is N. $\frac{1}{2}$ E. ; during day-time Christ church, a conspicuous white building with a spire, and standing on an eminence, will be seen shortly after rounding these islands, bearing N. by E. ; it should be kept just on the starboard bow. At night or during bad weather it is strongly recommended not to run for this harbour, as it can only be entered at certain stages of the tide, and the anchorage outside is at such times exposed and unsafe, while Royal bay or Esquimalt harbour is always available and safe ; but if it is decided to run for Victoria, it must be borne in mind that when Fisgard island light changes from white to red, a vessel will be very near the shore.

The Coast.—The coast from Victoria harbour trends in an easterly direction for 2 miles to Clover point, and is for the most part faced by white sandy cliffs, varying in height from 10 to 80 feet ; a sandy beach extends along the whole way, and at a cable off in many places are rocks and foul ground. At 2 cables east of Holland point, and a cable off shore, are the Glimpse reefs, which cover at three-quarters flood, and have 7 fathoms just outside them.

Beacon hill, a gentle rise of the land, 2 cables from the water's edge and a mile east of the harbour, is grassy and bare of trees ; its height is 140 feet.

Clover point, at 2 miles eastward of the entrance to Victoria harbour, is low, bare of trees, and projecting ; it is steep-to, and off it are some strong tide rips, dangerous to boats in heavy weather. Ross bay, eastward of it, is open, but sometimes used by small craft if waiting for the tide,—there being 4 to 5 fathoms water at 2 cables off shore.

Foul bay, nearly a mile north-east of Clover point, is of small extent and filled with rocks. Off its entrance are the Templar rocks, about 4 feet under water, and marked by kelp.

Foul point on the east side of the bay is rocky, but has not less than 4 fathoms at a cable's distance ; the land at the back of the point rises to a height of 280 feet, forming a rocky ridge or summit, known as Gonzales hill.

Trial Islands.—These are situated nearly $1\frac{1}{2}$ miles eastward from Clover point, on the south side of Enterprize channel ; they are two in number, bare and rocky, but generally appear as one. The south or largest island is 80 feet high, and steep-to at its outer end ; the northern one is low, and from it foul ground extends some distance. Strong tide ripples prevail off the southern island, especially during the flood, which runs nearly 6 knots at springs just outside it.

Enterprize Channel, between Trial islands and the Vancouver shore, is a narrow, tortuous, but deep channel, much used by steamers and coasters trading to Victoria harbour, as a slight saving of distance is effected, and less tide experienced than by going south of the Trial islands ; its length is about a mile, its width in the narrowest place half a cable, and there are not less than 24 feet in the shoalest part.

McNeil Bay, on the north side of the channel to the eastward of Foul point, is upwards of 8 cables in extent, with from 2 to 6 fathoms water ; it is open to the southward, and foul ground exists in its east part, but the bay is much used by small vessels waiting for the tide.

Mouatt Reef, in the eastern part of the channel, 8 cables from Trial island, and nearly 2 cables off shore, is about a cable in extent, and covers at a quarter-flood; this rock is dangerous for vessels using the Enterprize channel, as it lies north of the fairway.

Brodie Reef, with 8 fathoms on its shoalest part, lies nearly one mile N.E. $\frac{1}{4}$ N. from the summit of Trial island; it should be carefully avoided by vessels using Enterprize or Mayor channels.

Gonzales Point forms the south-east extremity of Vancouver island. It is a low salient point, rocky, bare of trees, and steep-to on the east side.

Oak Bay.—From Gonzales point, the Vancouver shore trends northward, and at a mile from the point forms a sandy bay which is somewhat less than a mile in extent, and affords fair anchorage near its north part in 3 to 4 fathoms.

The best anchorage is northward of Mary Todd islet, in the south part of the bay. This islet is bare, and about 80 feet high; at 2 cables east of it is Emily rock, 4 feet above high water, and the same distance south of it is Robson reef, which uncovers at low water.

Cadboro Bay, $2\frac{1}{2}$ miles northward of Gonzales point, is about half a mile in extent, and open to the south-eastward; no sea, however, rises within it, and there is good anchorage in 3 to 4 fathoms near the entrance.

The shore from Gonzales point to this bay is low and lightly timbered with dwarf oak and pine trees; northward of Oak bay it is clear of danger at a cable's distance.

Mayor Channel, northward of Gonzales point, and west of Chain islets, is about 2 miles long in a northerly direction; its breadth in the narrowest part is 3 cables, and the soundings in it vary from 9 to 13 fathoms. The channel is bounded on the west side by Thames shoal and Fiddle reef, and abreast the latter on its opposite side lies Lewis reef. The tide seldom runs more than 3 knots through this channel, and it is the one generally used.

Thames Shoal, of 2 fathoms water, is of small extent, and marked by kelp; it lies nearly half a mile N. by E. from Gonzales point, at the south-west part of the Mayor channel. Channel point in line with the west side of Great Chain islet, N. by E. $\frac{1}{4}$ E., leads a cable east of this shoal, and the highest part of Trial island in line with Gonzales point S. $\frac{1}{4}$ W., leads half a cable west.

Lee Rock, which only uncovers at low water springs, lies $1\frac{1}{2}$ cables westward of Thames shoal; it is marked by kelp and steep-to on the east side. Between this rock and Thames shoal is Mouatt channel, a cable wide, with 7 to 9 fathoms water.

The highest part of Trial island in line with Gonzales point, S. $\frac{1}{4}$ W., leads midway between Thames shoal and Lee rock; also through the fairway of the north part of Mayor channel between Fiddle and Lewis reefs.

Fiddle Reef, at the north-west extreme of Mayor channel, and upwards of a mile from Gonzales point, is of small extent, and awash at high water spring tides; it may be approached close-to on the east side.

Todd Rock, at 2 cables west of Fiddle reef, in the entrance to Oak bay, covers at two-thirds flood, and is marked by kelp.

Lewis Reef, at the north-east part of Mayor channel, nearly 3 cables south-east of

Fiddle reef, and 2 cables west of the Chain islets, covers at high water, and may be approached close-to on the west side. The passage between it and the Chain islets is filled with kelp, but has not less than 2 fathoms.

Chain Islets, midway between Discovery island and the Vancouver shore, are a bare rocky group, three-quarters of a mile long in a westerly direction, and half a mile wide. The largest, called Great Chain islet, is about a cable in extent and 30 feet above high water; it lies at the south-west side of the group, and its south part may be approached to a cable's distance.

Spencer Ledge, off their east side, at a distance of 2 cables from the easternmost high water rock, is marked by kelp, and has 9 feet on its shoalest part; if going through Hecate passage it requires to be guarded against. Cadboro point, open west of Channel point N.N.W. $\frac{1}{2}$ W., leads a cable east of this ledge through Hecate passage.

Caroline Reef, at the north part of the group, and connected to it by a rocky ledge, is of small extent, and covers at a quarter flood, but is well out of the track of vessels using any of the channels. Foul ground with from 3 to 4 fathoms, and marked by kelp, exists upwards of a cable west of it.

DISCOVERY and CHATHAM ISLANDS.—Discovery island is 2 miles north-east of Gonzales point, at the junction of the Haro and Fuca straits. It is wooded, about three-quarters of a mile in extent, and its shores on all sides are bordered by rocks, extending in some places more than 2 cables off. Rudlin bay on its south-east side is filled with rocks, and should not be used by any vessel.

Chatham islands, to the north-west of Discovery island, and separated from it by a narrow boat pass, are of small extent, forming an irregular group, low, wooded, and almost connected with each other at low water, the tide rushing with great strength through the passages between them; their west side is steep-to.

Leading point, at the south extreme, is a bare rocky islet at high water; to the eastward of it is a small boat cove. Channel point, their west extreme, is also bare and steep-to; the tide runs strong past it.

Strong Tide islet, the north-west of these islands, is rocky, about 50 feet high, and wooded; its west side forms the eastern boundary of Baynes channel, and is steep-to; the ebb tide runs very strongly past it, nearly 6 knots at springs.

Refuge cove, on the east side of the Chatham islands, is small, and has $1\frac{1}{2}$ fathoms in the centre; coasters or small craft entangled among these islets may find shelter in it. Alpha islet, the easternmost of the group, is bare, and 10 feet above high water; it is steep-to on the east side, but only a boat ought to go westward, or inside it.

Fulford Reef, 8 cables north of the Chatham islands, is about a cable in extent, and covers at three-quarters flood. Vessels using Baynes channel should keep well to the westward to avoid this reef, as the tide sets irregularly in its vicinity.

Hecate and Plumper Passages.—Discovery island is separated from the Chain islets by a passage half a mile wide in the narrowest part, forming an apparently clear and wide channel, but near the middle of the south part lies *Centre* rock, which has only 8 feet over it, and though marked by kelp, this, from the strength of the tides, is often run under, and seldom seen. There is a deep passage on each side of this

danger, the one to the westward being called Hecate, and the eastern one Plumper passage; the latter is wider and best adapted for large steamers, but the tide sets very strong through both of them.

Cadboro point, open west of Channel point N.N.W. $\frac{1}{2}$ W., leads through Hecate passage in mid-channel, west of Centre rock.

Cadboro point, well shut in north of Leading point N.W. $\frac{1}{2}$ N., leads through Plumper passage in mid-channel, east of Centre rock.

Baynes Channel, between Cadboro point and the Chatham islands, connecting these inner channels with Haro strait, is upwards of a mile long and half a mile wide; the soundings in it are irregular, varying from $4\frac{1}{2}$ to 80 fathoms, and the tide at springs rushes through it with great velocity, strongest along the eastern side.

The *Five-fathom* shoal, lying in the centre of the channel, is not marked by kelp; if wishing to avoid it a vessel has only to keep a little over on either side of mid-channel.

Cadboro Point, on the Vancouver shore, at the termination of the inner channels, is nearly 8 miles north of Gonzales point, and three-quarters of a mile west of the Chatham islands. It is about 50 feet high, rocky and bare of trees. A small islet lies just off it, also a reef which covers; in passing do not approach the islet within 2 cables.

The coast west of Cadboro point to Cadboro bay, is low, very much broken, and there are some off-lying rocks. *Jemmy Jones* islet, which is bare and 15 feet above high water, lies 8 cables off shore, midway between the two points; foul ground exists around it for upwards of a cable in some parts, and though there is deep water between it and the shore, none except small craft should go through that passage.

Directions.—None of these inner channels, though deep, should be used except by steamers of moderate size or small craft, unless in cases of necessity. Coasters and small steamers, when taking advantage of them, generally proceed through the Mayor channel. If using this channel, after passing Gonzales point keep the west side of Great Chain islet in line with Channel point N. by E. $\frac{1}{2}$ E. till within 2 cables of the islet, when the vessel will be clear of the Thames shoal, after which haul to the north-west bringing the highest part of Trial island in line with Gonzales point S. $\frac{1}{2}$ W., and with that mark on astern steer N. $\frac{1}{2}$ E., which will lead between the Fiddle and Lewis reefs, and on through Baynes channel, to Haro strait. When past Lewis and Fiddle reefs, a vessel may, if necessary, haul a little to the eastward for the fairway towards Strong Tide islet.

The Hecate and Plumper passages are nearly straight, and better adapted for large steamers than those west of the Chain islets. If using either of them, after passing half a mile south of the islets on a north-easterly course, bring the leading marks (given above) on, and keep them so till northward of the Centre rock, when steer up in mid-channel towards Cadboro point, and through Baynes channel into Haro strait.

Tides.—The high water at full and change is irregular and much influenced by prevailing winds; the greatest rise and fall of tide at Discovery island is 12 feet. During summer months in these channels, the flood stream commences at 11h. 15m. A.M., running with great strength till nearly 3h. P.M., after which but little tide is felt till 4h. A.M. on the following day, when the ebb commences and runs strong till nearly 11h. A.M., the time of low water by the shore.

Constance Bank, lying in Juan de Fuca strait, nearly 6 miles S.E. by E. $\frac{1}{4}$ E. from Fiegard island lighthouse, 8 miles S. by W. from Trial island, and 7 miles N.E. from Race island lighthouse, is upwards of a mile in extent, and has upon it a depth of 9 to 14 fathoms. A vessel should not anchor on it, as the bottom is rocky.

Fonte Bank, about a mile in extent, with from $3\frac{1}{2}$ to 5 fathoms and marked by kelp, lies nearly in the middle of Fuca strait, 6 miles S. $\frac{1}{4}$ W. from Cattle point (San Juan island), 8 miles E. by S. from Discovery island, and 8 miles W. $\frac{1}{4}$ S. from Smith island lighthouse.

This bank ought to be avoided, as there may be less water on it than is shown on the chart."

ADMIRALTY INLET, PUGET SOUND, AND HOOD CANAL.

Magnetic Variation in 1880:—Entrance of Admiralty Inlet $22\frac{1}{2}^{\circ}$ E.; in Puget Sound 22° E.; and in upper part of Hood Canal $22\frac{1}{2}^{\circ}$ E. The annual increase is estimated to be 2 minutes.

Smith Island and Light.—On the north-eastern side of the approach to Admiralty inlet is Smith island, which we now proceed to describe because it is an important object to vessels making the inlet either from Rosario strait or from westward. The direct course from Juan de Fuca strait into Admiralty inlet is between this island and the lighthouse on New Dungeness.

Smith island lies at the eastern termination of the strait of Juan de Fuca, within 6 miles of Whidbey island, and 7 miles from the southern entrance to Rosario strait. It is small, not occupying half a mile square, and rises regularly from the eastern to the western extremity, where it attains a height of about 55 feet, with an almost perpendicular cliff of clay and gravel. There is no fresh water to be found on the island.

A small low islet lies one mile north-east of Smith island, and at very low tides is connected with it by a narrow ridge of boulders and rocks. A field of kelp, with $6\frac{1}{2}$ fathoms water, extends westward of Smith island for $1\frac{1}{2}$ miles, and has a width of a mile. The bottom is hard and sandy, and no rocks have been discovered in it. Another smaller field is seen westward of the one just mentioned.

There is good anchorage on the north side of the island, east of the kelp, in 10 to 5 fathoms, and on the south side, east of the kelp, in 10 to 8 fathoms, hard bottom. Very deep water is found close to the eastern end of the small islet.

The lighthouse on Smith island shows a revolving light, flashing every half-minute, at 90 feet above the sea, visible 15 miles. Its geographical position is lat. $48^{\circ} 19' 4''$, long. $122^{\circ} 50' 86''$. From it Discovery island bears West, distant $16\frac{1}{2}$ miles; Race island light, S.W. by W. $\frac{3}{4}$ W., $26\frac{1}{2}$ miles; New Dungeness light, S.W. by S., $19\frac{1}{2}$ miles; Point Wilson light, S.E. $\frac{1}{4}$ S., 11 miles; and cape Colville, the south-west point of the entrance to Rosario strait, N. $\frac{1}{4}$ W., $6\frac{1}{2}$ miles.

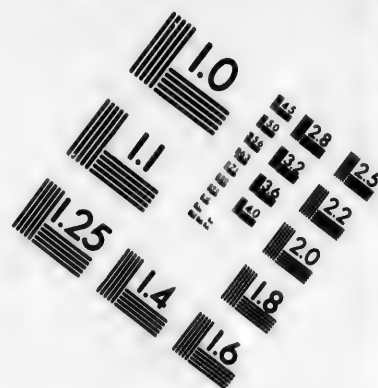
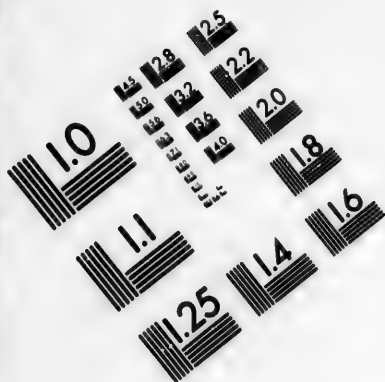
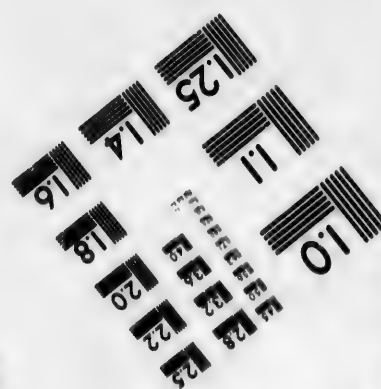
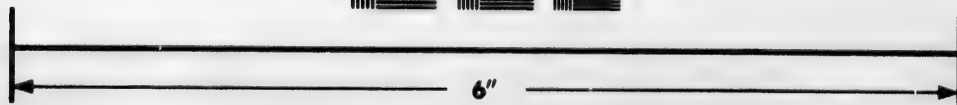
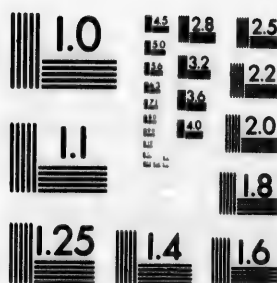


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Fields of Kelp.—At 8 miles southward from Smith island is an extensive field of kelp on a bank lying off Partridge point, Whidbey island. Within the 10-fathom curve the bank is 8 miles long, E.S.E. and W.N.W., and $1\frac{1}{4}$ miles wide. The north and east sides fall off sharply to 20 fathoms. A considerable part of the bank is covered with kelp, which is much under-run by strong currents. The bottom is generally sand, gravel and boulders, except near the shoalest spot, where it is rocky and thickly covered with kelp. The depth on this spot is only 14 feet and the general depth on the bank is 5 to 10 fathoms. The 14-foot spot is distant about $8\frac{1}{4}$ miles from the nearest shore of Whidbey island, and about the same distance south-east of Smith island lighthouse; it is guarded by a buoy moored in 20 feet water off its southern side.

At 8 miles W. $\frac{1}{4}$ S. from Smith island, is another field of kelp nearly a mile in extent, named Fonte bank, mentioned in page 299. The depth of water upon it is very uniform at 5 fathoms. Recent partial examinations show that this field marks the north-east portion of a bank lying nearly north and south, with a length of 4 miles, and a breadth of $1\frac{1}{4}$ miles within the limits of the 20-fathom line.

At a mile southward of the south-eastern point of San Juan island, and $8\frac{1}{4}$ miles N.W. by W. $\frac{1}{4}$ W. from Smith island, lies a small field of kelp about half a mile square, with 6 feet to 8 fathoms upon it. Recent examinations show that this is connected by a 4-fathom bank with the south-eastern end of San Juan island, and stretches S.S.E. therefrom for $2\frac{1}{4}$ miles, with a breadth of three-quarters of a mile within the limit of the 10-fathom line. It is named Salmon bank.

All these fields and patches of kelp should be avoided, as they denote rocky bottom; and isolated points of rocks frequently exist among them and escape even a very careful survey.

ADMIRALTY INLET.—Admiralty inlet, at the south-east extremity of Juan de Fuca strait, may be described as a vast canal, running in a general S.E. by S. direction for 60 miles to the south end of Vashon island. It has for that length an average width of $8\frac{1}{4}$ miles, and then branches into a multitude of arms, which cover an area of about 14 by 22 miles: the general direction of these is S.W. $\frac{1}{4}$ S., and they comprise what is called Puget sound.

At 16 miles from the entrance to the inlet an arm known as Hood canal opens upon the western side, and runs 60 miles S. by W., with an average width of $1\frac{1}{4}$ miles. At 25 miles from the entrance of the inlet another arm opens on the eastern side, runs north and north-west behind Whidbey island, forming Possession sound, ports Gardner and Susan, &c., and leads on to the strait of Juan de Fuca through Deception pass, at the north end of Whidbey island, in lat. $48^{\circ} 24\frac{1}{2}'$.

The shores of these inlets are generally bluffs, ranging from 50 to 500 feet in height, with their sides kept bright by the gradual wearing action of the water, and their tops covered with trees and thick undergrowth to their very edges. There is so much sameness in the shores that it requires some acquaintance with the different points to recognize them by their trifling peculiarities. The depth of water in the channels is remarkably great, and it is sometimes difficult to find anchorage sufficiently far from the shore to afford room for getting under way. Many superior harbours are

found in every direction, and small settlements are gradually springing up in favourable localities.

Admiralty inlet, Puget sound, and Hood canal have an aggregate shore-line of not less than 800 miles, yet the number of dangers known to exist in them is remarkably few.

We shall not attempt to give in detail all the peculiarities of this vast area of waters, but, following the mid-channel courses, will only note generally the objects as they come under the eye of the navigator.

The entrance to the inlet lies between point Partridge (Whidbey island) and point Wilson (on the main), on which is now a lighthouse. The bearing of the latter point from the former is S.E. by S. $\frac{1}{2}$ S., $4\frac{1}{2}$ miles; and the bluff head lying 2 or 3 miles to the east of this line, and destitute of trees and marked by a lighthouse is Admiralty head, around which the ebb current, and an ebb eddy on the flood, sweeps with force.

The first course inside the entrance of the inlet is E.S.E., $6\frac{1}{2}$ miles, passing port Townshend on the South, Admiralty head on the North, and changing the course abreast of Marrowstone point.

Point Partridge, the western point of Whidbey island, and directly facing the strait of Juan de Fuca, is very steep and yellow, and flat on the summit, which is covered with spruce, fir, and cedar. The point is so rounding that it is not easily recognized on coming from westward, but from southward and northward, it is well marked and prominent.

The highest part of the point is about 260 feet above low water. The approximate geographical position of the southern part of the point is lat $48^{\circ} 12' 59''$, long. $122^{\circ} 45' 7''$. From point Wilson lighthouse it bears N.W. by N. $\frac{1}{2}$ N., $4\frac{1}{2}$ miles; and from Admiralty head lighthouse N.W. by W. $\frac{1}{2}$ W., $5\frac{1}{2}$ miles.

Wilson Point Light.—A fixed white light is exhibited on the extremity of point Wilson from a square wooden tower; it is 58 feet above the sea, and visible 12 miles. Its geographical position is lat. $48^{\circ} 8' 41''$, long. $122^{\circ} 45' 5''$. A whistle is sounded in foggy weather, giving a blast every minute.

Port Townshend.—This harbour is favourably situated at the termination of the strait of Juan de Fuca, at the outlet of the waters of Admiralty inlet, Puget sound, &c., and in proximity to the great inland waters of British Columbia. The entrance lies between point Wilson and Marrowstone point, the latter bearing E.S.E. $8\frac{1}{2}$ miles from the former. Upon this line, and even outside of it, lies a bank extending two-thirds of the distance from Marrowstone point, and having upon it from 6 to 15 fathoms, with hard, sandy bottom. Inside of point Wilson, which is composed of low, sandy hillocks, lies another low point called point Hudson, distant $1\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S.

Starting from the entrance line, about $1\frac{1}{2}$ miles from Marrowstone point, the mid-channel course of the bay is S.S.W., 8 miles, with an average width of 2 miles; thence S.E. $\frac{1}{2}$ S. for $8\frac{1}{2}$ miles, with an average width of $1\frac{1}{2}$ miles. The depth of water throughout is very regular, and ranges from 8 to 15 fathoms, with soft, muddy bottom inside of point Hudson. Vessels coming from the strait steer for point Hudson, as soon as it is opened by point Wilson, passing the latter moderately close, as 20 fathoms are found 100 or 200 yards off it. Upon approaching point Hudson, and when within

half a mile of it, gradually keep away about a quarter of a mile in 5 to 10 fathoms, and, as it opens, run quite close, with the summer wind off shore, to save making a tack; keep along half a mile to the town situated under the Prairie bluff, and anchor anywhere off the end of the wharf, in 10 to 12 fathoms, about a quarter of a mile from shore. In winter anchor farther out, to clear point Hudson in getting under way with a south-easter.

When coming down the inlet, bound into the bay, with the current ebb, pass Marrowstone point nearly three-quarters of a mile before heading in for the town, and so avoid a very strong eddy which comes out of the bay along the bluff shore west of this point. If the wind be light and the current strong, pass the point quite close by; run along the outside of the rip, and try to get upon the bank as soon as practicable.

In summer vessels frequently drift about the entrance for days, without a breath of wind, and in very strong currents.

Tides.—The corrected establishment of the port is at 8h. 49m.; the mean rise and fall of tides is 4·6 feet, of springs 5·5 feet, and of neaps 4 feet.

The town of port Townshend has increased very much since the discovery of gold on Fraser river. No fresh water (1862) is to be had, but vessels can obtain a small supply near the military post, 2½ miles S. by W. from the town. Some fine farms lie near the town, and vegetables are plentiful at reasonable prices.

On the east side of the bay, abreast of the town, lies a long sand spit, nearly closing the north entrance to Kilisnoet harbour, which runs parallel to the inlet, and is separated by an island one mile wide and 6 miles long. At high tide this harbour communicates by a crooked boat channel with Oak bay at the south end.

At the head of port Townshend is a narrow channel opening into a large flat, bounded by a low, sandy beach, separating it from Oak bay. The Indians frequently use this as a portage.

The shores are generally bluffs, about 120 feet high, and covered with wood, except behind the town. Between the town and fort Townshend are two low pieces of grass and sand beach, backed by marsh and ponds. The 5-fathom curve extends but a few hundred yards from any part of the shores. A small patch of kelp lies off the southern point of Prairie bluff, and another off the north face of Marrowstone bluff.

Marrowstone point is a low sandy point stretching 800 yards eastward from the base of the bluff, and forming an indentation on its southern face, where anchorage may be had in 12 fathoms, with a current or eddy invariably running ebb. Small craft coming out of the inlet with a head wind can easily take advantage of this for 2 or 3 miles above the point.

Admiralty Head and Light.—Abreast the entrance to port Townshend, is a perpendicular cliff 80 feet high, falling on the eastern side to a low, pebbly shore, which runs 2 miles to the E.N.E. and strikes the high cliffs on the eastern side of the inlet. Behind this beach is a large lagoon, and off it is Admiralty bay, with hard, sandy bottom, in irregular ridges, and a depth of 15 to 25 fathoms of water. A strong current always makes out of the bay, and it is exposed to the full sweep of south-easters. The current is so strong that a vessel rides to it, and consequently lies in the trough of the sea.

The lighthouse on Admiralty head exhibits a *fixed white* light, at 119 feet above the water, visible about 17 miles. The tower is square, painted white; lantern red. Its geographical position is lat. $48^{\circ} 9' 16''$, long. $122^{\circ} 40' 84''$. It illuminates an arc of 270° of the horizon, and commands Admiralty inlet and the approaches. From point Wilson it bears N.E. by E., distant $8\frac{1}{2}$ miles; from Marrowstone point N. by W. $\frac{1}{2}$ W., distant $8\frac{1}{2}$ miles.

Starting from abreast Marrowstone point the mid-channel course up Admiralty inlet runs S.E. by S. $\frac{1}{2}$ S. for 7 miles. The shores on either hand are bluffs of apparently uniform height, covered with trees. After running thus about 5 miles there will be passed, on the eastern shore, a low point, with one or two clumps of trees and bushes, to which has been given the name Bush point. On the western shore is Nodule point, a rounding bluff a mile north of the north-east point of Oak bay; off this point is good anchorage in 12 or 15 fathoms. The high bold headland, several miles directly ahead, is Foulweather bluff, and that to the E.S.E. destitute of trees, except one large clump, which marks it conspicuously from this direction, is Double bluff. The deep indentation between it and Bush point, with low land in the rear, is Mutiny bay, in the northern part of which exists a narrow bank of 11 fathoms, affording an excellent fishing ground. At the end of the course Oak bay opens to the westward, and stretches towards the port of Townshend.

The opening west of Foulweather bluff is Hood canal (subsequently mentioned). Vessels bound into it keep close to the western shore of the bluff, and pass two low points lying near together. The water off them is deep. Off the north face of Foulweather bluff, for nearly a mile, a depth of less than 15 fathoms may be found. Kelp exists under the face of the bluff, and vessels may pass around it in 6 or 7 fathoms. The bottom along the edge of the kelp is rocky. On the west side of the entrance to Hood canal is port Ludlow, which will be described hereafter.

The next or third course up the inlet is E.S.E. for 10 miles, passing on the eastward Double bluff, which stretches north-eastward for a mile, and rises 800 or 400 feet, having its top covered with wood. The bluff running also to the northward forms Useless bay. This has deep water over the greater portion of it, with a large shallow bay called Deer lagoon at its head. The high bluff forming the southern point of Useless bay is Satchet head. A similar bluff lies 2 miles E. by S. of it. These form the southern extremity of Whidbey island, in latitude $47^{\circ} 54'$, and are the turning points into Possession sound.

The two heads are about 800 feet high, covered with wood, and separated by a depression, which is in part overflowed at high tide, and then presents the appearance of a small bay. From the eastern head round the western, and a mile towards Useless bay, the low-water line makes out half a mile, the shore being bare where some recent maps have deep water. For nearly a mile south of both heads a depth of 8 and 10 fathoms and smooth sandy bottom can be found. The surveyors found, when anchored for several days off the eastern head, a strong under current running into Possession sound, and an upper current setting to the westward, at all tides.

On the western side of the last mid-channel course is Foulweather bluff (already noticed), which is perpendicular on its N.N.W. face, and about 225 feet high, with

heavy firs upon its summit. It slopes towards the east to a bluff 40 feet high, but is steep on the side next to Hood canal. The low point with a lighthouse on it, 4 miles eastward of Foulweather bluff, is point No-Point, making well out, and destitute of trees or bushes. Between it and the bluff is a deep bight, and the distance across the neck to Hood canal is only a quarter of a mile in one part. On the south side of point No-Point is good anchorage in 10 fathoms; and thence the western shore runs nearly straight S.E. by S. for 10 miles.

Point No-Point Light.—A fixed white light is exhibited on point No-Point from a low square tower painted white; it is 27 feet above the water, and visible 10 miles. Its geographical position is lat. $47^{\circ} 54' 41''$, long. $122^{\circ} 81' 6''$; from it Admiralty head light bears N.W. $\frac{1}{4}$ N., distant 16 miles. A bell is sounded in foggy weather at intervals of 10 seconds.

At 8 miles beyond point No-Point the inlet expands to a width of 7 miles. Thence an E.N.E. course for $8\frac{1}{4}$ miles carries to the entrance of Possession sound, the first 6 miles through which run N. $\frac{1}{4}$ W., with a width of 2 miles and bluff shores; it then turns to the north-westward to port Gardner. The water is deep in the entrance, and affords no anchorage. The low point on the shore, 4 miles after entering, is point Elliott, and the bay opening to the north-east receives the Sinahomis or Scaget river.

The next, or fourth, mid-channel course up the inlet is S.S.E. for 21 miles to Allen bank, which lies a mile off the north end of Vashon island. Five miles on this course, or 7 from point No-Point, brings us to an excellent little harbour on the western side of the inlet, called Apple Tree cove, having a low point on the north side, with a soft mud flat extending several hundred yards up the inlet. A depth of from 5 to 12 fathoms on sticky bottom are found off it and in the cove. There is no fresh-water in the vicinity, but very good timber may be procured suitable for boats spars and booms.

On the eastern shore of the inlet, abreast of Apple Tree cove, are two low points, a mile apart, making out from the bluff. The indentation between them forms a good though small anchorage, and the chances are good for fresh water at high tide. The southern point is named point Wells, the north point Edmund. The inlet is here only 8 miles wide, and continues so to point Jefferson, 2 miles southward of Apple Tree cove. This is a moderately low, straight bluff, with the ground rising behind it, and covered with timber. Extending off its eastern face for three-quarters of a mile is a 9-fathom shoal, which affords good anchorage for vessels when drifting with light airs and adverse currents.

At night.—Vessels entering Admiralty inlet from Juan de Fuca strait should stand for Admiralty head light on an E. by N. course, keeping point Wilson light open on the starboard bow. When point Wilson light bears S.S.W. $\frac{1}{4}$ W. a S.E. $\frac{1}{4}$ E. course will lead through Admiralty inlet direct to point No-Point. When Double bluff bears N. by E. $\frac{1}{4}$ E. change course to E. by S. until point No-Point bears South, when alter course to S.E. $\frac{1}{4}$ S. for the southern part of the sound (1879).

Ports Madison and Orchard.—Point Jefferson is the northern side of the entrance to port Madison, which runs 8 miles W.S.W., with an average width of 2 miles and a great depth of water, except under point Jefferson, where anchorage may be had in 10 and 15 fathoms, hard sandy bottom, with patches of kelp inshore.

The south-east point of the entrance is low and sandy, making out from high wooded ground. One mile west of it is the narrow entrance to a natural canal, upon which, in full view, are situated the port Madison saw-mills. At the south-west part of the bay is the very narrow entrance to port Orchard. The channel is somewhat crooked, but it has 8 and 4 fathoms water in it. On the western side of this entrance are some white patches of beach, formed by clam shells. In 1857 an Indian village was situated here, and an Indian sub-agency. Both sides of the entrance are bluffs. Vessels not well acquainted with the channel must enter under easy sail, and keep a lead going on each side of the vessel to ascertain where the deepest water lies. After getting through give the point, one mile off on the western side, a berth of nearly half a mile, to avoid a shoal which makes out east from it. Thence it is plain sailing in 15 to 25 fathoms of water. After passing the first point an arm opens to the N.W., and many vessels load there with spars. Ten miles up the southern channel is, or was, a saw-mill. In coming out of this port vessels should not trust the southern entrance, but leave as they entered. See subsequent remarks under heading "Restoration point."

Bainbridge island lies between port Orchard, port Madison, and Admiralty inlet. It is 8 miles long by 2½ miles in breadth, and its general direction is S.E. by S. A few loggers' huts stand on the western side and the Madison saw-mill at the north end. On the south-east part it is indented by two small harbours.

Duwamish Bay.—Abreast port Madison the eastern shore of Admiralty inlet retreats and there receives several small streams, but it gradually extends out into a very long low sandy point, named West point, which forms the extreme north-west part of the entrance to Duwamish bay. The bay runs E. by S. 6½ miles and has a width of 2 miles. To the south point, known as Battery or Roberts point, which is low and bare, with a curiously shaped mound rising sharply behind it, the course is about S.E. by S., and distance 4½ miles. Under West point there is anchorage in 10 to 15 fathoms after getting towards the bluff, but on the north side of the point the water is very deep. Through the centre of the bay the depth ranges from 88 to 40 fathoms. The beach is smooth and very regular, being composed of sand and gravel. On this side of Battery point is the deserted town of Alki (the Indian phrase for "by and by"). There is nothing about the town to command trade.

The bluff head within the bay, 2 miles N.N.E. of Battery point, is Duwamish head. It is steep, about 150 feet high, covered with timber, and the beach at low water stretches out over a quarter of a mile N.N.W. from it. The head of the bay receives the Duwamish river, and for 1 or 2 miles is an extensive flat, bare at low water.

The town of Seattle is on a small point at the north-east part of the bay, a little over 5 miles inside of West point. It consists of a few houses and stores, a church, a small saw-mill, and a number of other buildings. It has but little trade.

The usual anchorage is directly off the wharf in 10 to 15 fathoms water, with the large white house on the extreme point bearing about East, or E. by S., and at a distance from the beach of about 2½ cables. This position will enable a vessel to work well out by making the first tack to the southward towards the flat. If it be high water this flat cannot be distinguished, and the lead must be kept going. When a

depth of 15 fathoms is struck go about, for it shoals to 8 fathoms very suddenly, and keeping on would soon bring up a vessel on the flat.

Restoration Point.—From the south-east point of port Madison to this point the shore is bluff and somewhat irregular, and is indented first by Eagle harbour, having a long pebbly spit making out $1\frac{1}{2}$ to 2 cables S.E. from its north point; and next, at point Restoration, by Blakely harbour, having off its entrance a large rock, 15 feet high, with deep water all round it. The rock bears nearly N.N.W., three-quarters of a mile from the point, and the bottom between is irregular, the depth ranging from 20 to 40 fathoms. Blakely harbour is only a quarter of a mile wide and three-quarters long, with 18 fathoms sticky bottom at its mouth, and shoaling gradually inside, but most on the south side; it is not so commodious as Eagle harbour.

Restoration point is in some respects very peculiar; no other in these waters, except Battery point, presenting the same formation. For 800 yards its south-east face is flat, about 10 feet above high water; inshore it rises up sharply about 100 feet, its sides covered with grass, and the summit with fir trees. On the upper levels of the high land adjacent are several small lakes.

From the extremity of the point a ledge, bare at low tides, makes out $1\frac{1}{2}$ cable, but the depth is 6 fathoms at 100 yards from its extremity, and 16 fathoms at a quarter of a mile. Anchorage may be had S.S.E. of the point, distant a quarter of a mile in 15 fathoms, sticky bottom; a rule for finding anchorage, is to bring the rock north of it to range just over and inside of the point. Kelp exists along the southern face.

The geographical position of Restoration point is about lat. $47^{\circ} 35'$, long. $122^{\circ} 28'$; from it Battery point bears E. by N. $\frac{1}{2}$ N., distant $2\frac{1}{2}$ miles.

Tides.—The approximate corrected establishment at Restoration point is 4h. 4m. The mean rise and fall is about 7.4 feet.

South of Restoration point, Admiralty inlet opens westward for a couple of miles into a bay, in which is situated an island about three-quarters of a mile in extent, called Blake. From the north-west part of the bay, a narrow crooked pass 8 miles long, leads to the southern part of port Orchard, which spreads out into several arms. The pass is obstructed by rocks and is difficult of navigation. The winds are variable, light, and uncertain at its narrowest part, where it makes a sharp turn, and is only 200 yards wide, with a rushing current. The channel generally used, although narrower than the one just mentioned, is that leading into port Madison.

Allen Bank, off the north end of Vashon island, is nearly a mile in extent, and has as little as 10 fathoms upon it, with a variable bottom, in some places mud, and in others hard sand. Between the anchorage and Blake island the water regularly deepens to about 18 fathoms soft mud. The eastern point of Blake island is low and pebbly, and called by the natives Tatugh; under it is anchorage in 17 and 18 fathoms, soft mud. The north-west extremity of Vashon island is named point Vashon; the point abreast of it is point Southworth; and the channel commencing between the last two points is Colvos passage, running west of Vashon island.

The main body of Admiralty inlet continues about S.E. for 8 miles, then S.S.W. 8 miles farther, with an average width of 2 miles. In this stretch the currents are moderately strong, the chances for anchoring few, and it is sometimes calm while a fine breeze is blowing through Colvos passage.

Brace point lies on the east side of the inlet, about 4 miles south-eastward of Roberts point. Point Pully, a round-topped point having two or three lone fir trees upon it, and situated on the same side of the inlet, is distant 4 miles above Brace point. The geographical position of the summit of point Pully is lat. $47^{\circ} 27' 7''$, long. $122^{\circ} 22' 21''$.

There is a small bight north of Brace point, and between it and another low point, is an inlet called Fauntleroy cove, having good anchorage in 10 and 12 fathoms, and fresh-water is easily obtained in the vicinity. Between Brace point and point Pully

a small peninsula, on the east. In this bight is anchorage in 15 fathoms, with whirling eddies. On the south face of this peninsula, and outside of the kelp, anchorage may also be had.

PUGET SOUND.—This collection of inlets commences after passing "The Narrows," and covers an area of 14 miles by 22 miles, in the general direction of S.W. & S. The aggregate shore-line of this sound, and the adjacent part of Admiralty inlet, with Colvos passage, to the north end of Vashon island, is not less than 870 miles. Upon its shores are situated the settlements of Steilacoom, Nisqually, Olympia, and Newmarket.

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Restoration Point.—From the south-east point of port Madison to this point the shore is bluff and somewhat irregular, and is indented first by Eagle harbour, having a long pebbly spit making out $1\frac{1}{2}$ to 2 cables S.E. from its north point; and next, at point Restoration, by Blakely harbour, having off its entrance a large rock, 15 feet high, with deep water all round it. The rock bears nearly N.N.W., three-quarters of a mile from the point, and the bottom between is irregular. the depth varying from 30 to 40

[To face page 307, North Pacific Pilot, Part 1.]

Commencement Bay.—Port Tacoma (Commencement bay), the terminus of the Northern Pacific Railroad on the Pacific, is looming up into prominence as a possible rival of San Francisco, now that the Northern overland route approaches completion. Tacoma possesses many natural advantages. It is the centre of the largest lumber forest in the world, and extensive deposits of fine bituminous coal, which, extending 30 miles back, runs through five veins, estimated at 236,700,000 tons, besides rich tributaries. This "black diamond" field should give the new port an enduring vitality. There is also considerable iron ore in the appendage, enough to sustain an enormous industry. Its recommendation as a port exists in the fact that from the ocean to the Tacoma docks there is not a bar, rock, reef or sandbank. The entrance to Puget sound is 13 miles wide and 600 feet deep, maintained from the mouth of the Straits of Fuca to Commencement bay, which is the Tacoma harbour. Pilotage and towage could be dispensed with by incoming vessels. Arrangements by railroad are to be made that will make this a great wheat shipping port, commanding the wheat of Eastern Washington Territory and North-Eastern Oregon and Idaho. Tacoma has now a population of 4000 people, which is being increased so rapidly that the saw mills are not able to supply the demand for lumber, though kept running night and day. The Northern Pacific Railroad Company is projecting shops and buildings on a scale commensurate to the size of a great city, and it is a question of months rather than years when this place will be one of the controlling influences of the North-West Coast.—*New York Shipping List*, April 1888.

pebbly, and called by the natives Tatugh; under it is anchorage in 17 and 18 fathoms, soft mud. The north-west extremity of Vashon island is named point Vashon; the point abreast of it is point Southworth; and the channel commencing between the last two points is Colvos passage, running west of Vashon island.

The main body of Admiralty inlet continues about S.E. for 8 miles, then S.S.W. 8 miles farther, with an average width of 2 miles. In this stretch the currents are moderately strong, the chances for anchoring few, and it is sometimes calm while a fine breeze is blowing through Colvos passage.

Brace point lies on the east side of the inlet, about 4 miles south-eastward of Roberts point. Point Pully, a round-topped point having two or three lone fir trees upon it, and situated on the same side of the inlet, is distant 4 miles above Brace point. The geographical position of the summit of point Pully is lat. $47^{\circ} 27' 7''$, long. $122^{\circ} 22' 21''$.

There is a small bight north of Brace point, and between it and another low point, is an inlet called Fautleroy cove, having good anchorage in 10 and 12 fathoms, and fresh-water is easily obtained in the vicinity. Between Brace point and point Pully two or three streams disembogue, and another from the valley a mile east of the high bluff at Pully point. Off this valley a flat makes out with deep water at its edge.

Colvos passage is the usual route towards Puget sound. It is about a mile wide, with high bluff shores, varied by numerous small low sandy points making out from the face of the bluff, and having deep water off them. The passage is 11 miles long to the south end of Vashon island, named Dalco point, and it runs with a nearly straight course S. by E. At $1\frac{1}{4}$ miles inside of point Vashon there is a small curve in the shore line known as Fern cove, with excellent anchorage in 5 and 10 fathoms. Abreast Dalco point on the western shore there is a small harbour, with a narrow and shoal entrance, known as Gig harbour. Looking out of the passage to the north, mount Baker shows distinctly in clear weather.

Commencement Bay.—When abreast Dalco point this bay, at the termination of Admiralty inlet, opens to the E.S.E., and over its low background shows the high snow-covered peak of mount Rainier. The general direction of the bay is E. by S. $\frac{1}{4}$ S., with a length of 8 or 4 miles, a width of 2 miles, and a great depth of water up to the line of the extensive flat at its head, which is backed by marsh. There are no settlements upon it (1862).

Vashon island, lying between the southern extremity of Admiralty inlet and Colvos passage, is $11\frac{1}{4}$ miles long, with an average width of $2\frac{1}{4}$ miles. The island is high, with steep shores, covered with wood and undergrowth. Its surface is marshy in many parts that are quite elevated.

Point Defiance and the Narrows.—The high sharp yellow bluff facing the south entrance to Colvos passage is named point Defiance, and between it and the western shore pass all the waters of Puget sound. This passage is known as the Narrows. Its average width is three-quarters of a mile, and very uniform; the shores are high, bold, and in some places, rocky. For 2 miles to the S.E. its course is a regular curve. The next turn is to the southward, and at a distance of 2 miles in that direction the waters of the sound open ahead, with a narrow pass between the main and Fox island to the west: and a small indentation, backed by low ground, and formed on the south by a small peninsula, on the east. In this bight is anchorage in 15 fathoms, with whirling eddies. On the south face of this peninsula, and outside of the kelp, anchorage may also be had.

PUGET SOUND.—This collection of inlets commences after passing "The Narrows," and covers an area of 14 miles by 22 miles, in the general direction of S.W. $\frac{3}{4}$ S. The aggregate shore-line of this sound, and the adjacent part of Admiralty inlet, with Colvos passage, to the north end of Vashon island, is not less than 370 miles. Upon its shores are situated the settlements of Steilacoom, Nisqually, Olympia, and Newmarket.

Steilacoom.—On the eastern shore of Puget sound, 9 miles south of point Defiance, is situated the town or village of Steilacoom, upon a rising bluff. It consists of only a few houses. Fort Steilacoom stands about a mile inland, upon a piece of gravelly prairie, and roads lead from it to the town and the creek.

The neighbouring country is only moderately well adapted to agriculture, except along the bottoms of the small streams.

The usual anchorage is off the small wharf, in 15 fathoms, hard bottom, and about 2 to 2½ cables from the shore. An island lying 2½ miles westward of that position is named McNeil (or Duntze), and between it and Fox (or Rosario) island, to the northward, there is a passage 1½ miles wide. The passage on the south side of McNeil island, between it and Anderson (or Fisgard) island, is generally known as Balch passage. It bears about S.W. by W. from the anchorage, and is marked by a small wooded islet in it, named Eagle island, off which lies rocky bottom, and vessels keep closer to the north shore. This passage is the direct channel to Olympia, instead of following the broad one southward of Steilacoom.

The north end of the island, showing to the southward, and 1½ miles from the anchorage, is Kitson island.

One mile north of the anchorage is the mouth of a small stream called the Steilacoom river.

When approaching Steilacoom, or bound direct for Olympia, a patch of kelp, with foul bottom and less than 8 fathoms of water upon it, must be avoided. It bears S.S.E. one mile from the south end of Fox island, and N.W. by W. 1½ miles from Steilacoom wharf. The tide-rip upon it and abreast of the town is very great; quite sufficient with a little wind to swamp a small boat. The shores of the main and islands are bold, nearly uniform in height, and covered with trees.

Tides.—The corrected establishment of the port is 4h. 40m. The mean rise and fall of tides is 9·2 feet, of spring tides 11·1 feet, and of neap tides 7·2 feet.

Nisqually, 5 miles south of Steilacoom, and on the same side of the sound, is, at present, a place of no trade or importance. It was one of the early posts of the Hudson Bay Company, and is still (1862) occupied by them. An extensive mud flat exists off the mouth of the wide marshy valley, but the depth of water is very great close to it, and the anchorage room very much contracted. The river Nisqually empties here, and we believe there are two small saw-mills upon it. The name is Indian.

Olympia.—It would be almost useless to attempt to describe the route to Olympia from Steilacoom, as a local pilot is absolutely necessary in making the passage. The mid-channel course is 21 miles in length, and its width from half a mile to 1½ miles.

Olympia is situated at the head of Budd inlet, which is 6 miles long and three-quarters of a mile wide, and runs nearly South. The shores are steep and wooded, and the head of the bay is an immense mud flat, behind which is the town. It acquires prospective importance by being the capital of the territory, but especially on account of its proximity to the Columbia river valley, and to the headwaters of the Chehalis. There is a saw-mill at Newmarket, 2 miles south, on the Tumwater, and three others in the vicinity, besides one or two grist-mills.

A depth of 8 fathoms can be carried on the west side of Budd inlet, within $1\frac{1}{2}$ miles of the wharf; and one fathom within a mile on the eastern side. Vessels are brought up to the wharf at the highest tides, and then rest in the mud until ready to leave.

The greatest difference between the highest and lowest tides is reported to be about 24 feet, and is doubtless more than this when we compare its position with that of Steilacoom. The approximate corrected establishment is 5h. 8m., and the mean rise and fall of tides 9.2 feet.

The approximate geographical position of the wharf at Olympia is lat. $47^{\circ} 8'$, long. $123^{\circ} 55'$.

HOOD CANAL.—The entrance to this arm of Admiralty inlet lies between Basalt point and Foulweather bluff, the latter bearing E. $\frac{1}{2}$ S., distant $8\frac{1}{2}$ miles from the former.

The first mid-channel course is S.E. for 4 miles, pointing directly into port Gamble, at the entrance to which the houses and mill are plainly visible; and passing a high, round, wooded peninsula on the west side of the channel, and connected to the main by a narrow neck of low sand beach. This is frequently mistaken for an island, and is known as Hood head. Between this head and port Gamble the canal changes its course and runs in nearly a straight line S. by W. 40 miles, with an average width of $1\frac{1}{2}$ miles. In lat. $47^{\circ} 21'$ it makes an abrupt turn, and runs for 12 or 18 miles about N.E.

Port Ludlow.—Close to Basalt point lie some rocks, with others about half a mile S.E., known as the Colvos rocks, among which is one 25 feet high, but of small extent. Close in-shore, and abreast this, is a rock just awash at high tide, but between the two runs a channel with 15 fathoms water, having soft muddy bottom. The bright bluff head $1\frac{1}{2}$ miles S.E. of the Colvos rocks, and about 2 miles S.W. by W. from Foulweather bluff, is Tala point. Halfway between the Colvos rocks and this point is the usual entrance, over a sand bar having $4\frac{1}{2}$ fathoms. The 8-fathom line stretches half a miles S.E. of Colvos rocks. If the wind and currents do not suit for this channel, run inside of the Colvos rocks, carrying deep water and 8 fathoms, soft, muddy bottom, anywhere inside of Tala point, even past the saw-mill, if necessary. The general direction of the shore from Basalt point to the saw-mill on the low sand point inside, is S.S.E. $2\frac{1}{2}$ miles. Abreast Tala point the width of the bay is three-quarters of a mile, but it gradually contracts to less than half a mile at the saw-mill, at which vessels load. Inside of the saw-mill point is an excellent anchorage in 7 and 8 fathoms.

Of all the small harbours in these waters this has the preference, as it is completely land-locked, and protected from gales from every quarter by the high land and high trees around it. The approach to port Ludlow is, or was, indicated by buoys.

Port Gamble.—After passing Foulweather bluff keep closer to the eastern shore than to the western, to avoid the strong current passing round the low point which makes out from Hood head. Run for the saw-mill, plainly in sight, on the western side of the entrance to the bay, and when within a mile of it approach the eastern bluff within one-third of a mile, in about 10 or 15 fathoms, gradually drawing close in-shore, and passing between the outer white and inner black can buoys. At the lowest tides the white one is in 15 feet, the black in $12\frac{1}{2}$, and the small spar buoy between them in

mid-channel in 17 feet, but it rarely shows above water at any tide. After passing these buoys the mill bears almost S.S.E. half a mile distant. Steer S.E., or half-way between the mill wharf and the east point, pass to the east of the white spar buoy, which is in 12½ feet water, and run through the entrance, passing the wharf at about one-third of the distance between the points. Do not round up to the eastward, as a shoal makes out almost parallel with the point.

If the wind be ahead while beating up, it will be impossible for a large vessel to get in, as the channel is half a mile long, and not over 100 yards wide at the narrowest part. Anchor off the buoys, and drop in with the early flood, or warp in with the last of the ebb. On the shoal forming the western side of the passage 10 feet water may be found until up with the white spar buoy.

Inside of the points the bay appears to open well under the eastern one, but the 8-fathom line makes out on a line with the end of the point. On the western side is a crib, around which a shoal has formed—anchor just beyond it in 5 fathoms, soft muddy bottom. The depth of water throughout the bay is from 4 to 9 fathoms, with mud bottom. The length of the bay is 2½ miles, its width three-quarters of a mile, and its direction south-east. The shores are steep, but not high, and are bordered by sand and pebble beach. We believe there is a road from this place to port Madison.

In summer the wind generally blows into the harbour lightly; in winter the S.E. gales draw directly out. Loaded vessels must warp out in summer, or trust to a light southerly air in the morning, with an ebb tide. None but small, smart working vessels can beat out, and few of those have done so within the channel limits.

The approximate geographical position of the eastern point of the entrance is lat. 47° 51' 32", long. 122° 38' 56".

At about 3 miles from Hood head, on the western side of the canal, is Squamish harbour. A large sand bank occupies its centre, and extends a mile in length N.N.W., by half a mile in width. The approaches to the shoal, which is in part bare, are detected in thick weather by the lead, the soundings decreasing regularly from 20 fathoms. Keep, however, close under the northern shore, which runs 2 miles W.S.W. from the low point known as Termination point.

At 14 miles from Hood head the canal curves more to the southward, and then to the S.S.W. around Hazel point, on the west side of which a large arm of the canal extends in a northerly direction for 10 miles, bifurcating near its head. On its western side the eastern spurs of the Olympus range reach its waters, and form the western shore-line of the canal to the great bend.

At 2 miles south of Hazel point, and on the eastern side of the canal, is a fine harbour, formerly called Hahainish harbour, but the name has been changed by settlers, who have lately built a small saw-mill there. It is formed by Seabeck island on the west, and is about a mile long by half a mile wide, with good bottom in from 10 to 15 fathoms, the depth decreasing to the head.

South of Hahainish harbour Hood canal is slightly contracted in width, but continues in the same general direction to about latitude 47° 21', ("Vancouver's farthest"), where it takes an abrupt turn, and stretches E. by N. ¼ N. 4 miles. The width in that part contracts to half a mile, and the shores overlap. From this it takes another

slight bend, runs N.E. by N. 8 or 9 miles, and reaches within 2 or 3 miles of the northern extremity of Case inlet, an arm of Puget sound. A large lake lies between the inlet and the canal.

The following remarks on Puget sound, &c., are abridged from an article that appeared in the *Mercantile Marine Magazine*, 1868 :—" Puget sound has fine natural advantages and unrivalled beauties, while the thriving towns and numerous large lumbering camps indicate that enterprising men with means are there. To enter into brief detail, then, we begin at the head of the sound and go northward :—

Olympia, the capital of Washington Territory, is 140 miles from Portland (per stage) and 480 miles from Victoria (per steamer). Two miles above, the Tumwater river falls 60 feet in 500 yards, affording a very fine water-power. There is a large flour-mill just below the falls, also a saw-mill and tannery ; and a village has grown up along the banks of the Tumwater. Olympia is in tri-weekly mail connection with Portland, overland, and weekly with Victoria and various way-points by steamer. The population is 800.

Steilacoom, the county seat of Pierce county, is 25 miles below Olympia. Fort Steilacoom (now unoccupied) is $1\frac{1}{2}$ miles from the town—back from the water. The population is 150.

Seattle is 80 miles below Steilacoom, on the east shore of the sound ; it is situated on an eminence overlooking Seattle bay, and contains a saw-mill that cuts 20,000 feet per day. It has a good harbour, and three steamboats ; and it employs three vessels shipping piles to San Francisco. The present population is 500. From Seattle to port Townshend the distance is 60 miles.

Port Madison.—Passing across the sound from Seattle to the north-west, and around a point on the north shore of Bainbridge island, we enter Port Madison bay, which is 800 yards wide and completely landlocked—one of the cosiest bays on the sound. Port Madison is 15 miles from Seattle, on the east shore of the bay, and about 85 miles from port Townshend. There is here a steam mill, cutting 75,000 feet of lumber per day ; also, 600 feet of dock.

Tekalet (Port Gamble) is 8 miles by trail, or 25 miles by water from port Madison, and 20 miles above port Townshend. At this point is the most extensive lumbering establishment on the sound, if not on the Pacific coast. Tekalet employs 800 men, and has machine shops, stores, and hydrant water.

Port Ludlow.—Seven miles from Tekalet are the noted Ludlow mills which cut 75,000 feet per day, besides lath and shingles. The harbour consists of a well protected crescent-formed bay. The town site has a southern exposure. It is 16 miles from port Townshend.

Port Townshend, which is near the entrance to the sound proper, and 40 miles from Victoria, has the custom house. It is also the county seat, and has an increasing population. The residences are mostly situated on a high bank, commanding a fine view. The climate of the port, though somewhat disagreeable in winter, is exceedingly salubrious. The population of the town is 300.

There are other points on the sound where lumber is cut. At least five other fine mills are now (1868) working, namely :—one at Seabeck, cutting 60,000 feet per day ;

others at port Orchard, port Discovery, and Utsalady, each about the same capacity as that at Seabock: and one at port Blakely, which is a little smaller.

Puget sound, then, being a fine, capacious harbour, in range with the Trade-winds of the Chinese seas and East Indies; supplied with abundance of timber, enough to last for three centuries to come; surrounded with a fertile agricultural country, and possessing unlimited water power, inexhaustible coal mines, and valuable fisheries, must become in the future a very important section of the Pacific slope."

POSSESSION SOUND AND ANCHORAGES.

Magnetic Variation in 1880:—Possession Sound, south entrance, $22\frac{1}{2}^{\circ}$ E.; Ports Gardner and Susan $22\frac{1}{2}^{\circ}$ E.; Deception Passage $22\frac{1}{2}^{\circ}$ E.

The annual increase is estimated to be 2 minutes.

WHIDBEY ISLAND.—This long crooked island has been already mentioned as lying at the entrance to Admiralty inlet, and forming for a considerable extent its eastern shore. It is about 33 miles long, and so irregular is its outline, that in some places it is not more than a mile broad. The soil is represented to be good, and the timber to be excellent, and it is said that there are also several open plains suitable for grazing purposes. On it are many small villages, and the inhabitants, which are of the Seatchat tribe, are more numerous than in any part of Juan de Fuca strait or Puget sound.

The channel between Whidbey island and the main, named Possession sound, contains several places of excellent anchorage, of which the principal are ports Gardner and Susan, and Penn cove. The water throughout is in general deep, but believed to be not so deep as in Admiralty inlet.

The western shore of Whidbey island has been already referred to on pages 800-1, also the bank lying off Partridge point. We are unable to give a detailed description of the shores of this island, as the locality has not been minutely surveyed. It is possible other banks may exist off its shores besides those mentioned.

FIDALGO ISLAND.—At the north end of Whidbey island, and separated from it by a narrow and dangerous channel, named Deception passage, is Fidalgo island. It has an extent of about 6 miles, and on its eastern side is almost connected to the main, the land between being marshy and traversed only by a narrow channel of no great depth. Mount Erie, in its centre, rises to the height of 1250 feet. On the western side of the island is Burrows bay, which is protected from westerly winds by Allan, Burrows, and Young islets. In this bay vessels may anchor in about 10 fathoms and wait for a suitable wind to carry them through Rosario strait.

The country around Fidalgo island presents a very different aspect to that farther southward. The shores are composed of steep rugged rocks, whose surf varies considerably in respect to height, and exhibits little more than the barren rock, which in some places produces a little herbage of a dull colour, with a few dwarf trees.

Deception Passage communicates with Possession sound, and is a narrow intricate channel, which, for a considerable distance, is not 40 yards in width, and abounds with

rocks above and beneath the surface. These impediments, in addition to the great rapidity and irregularity of the tide, render the passage navigable only for boats, or vessels of very small burden. In front of the western entrance is a small islet, having a sunken reef off its south side.

POSSESSION SOUND.—This is the extensive sound between Whidbey island and the main; its principal and indeed only navigable entrance for ships is from Admiralty inlet, between the south end of the island and the main shore, in lat. $47^{\circ} 54'$. On the eastern shore, near the entrance, is the outlet of the Sinahomis river; off which is a small high island, in the middle of the sound, having a depth of 12 to 20 fathoms close to it all round. The shores of the sound are in general regular, and of but moderate elevation, and Vancouver observes:—"We found the shores of the inlet to be straight, compact, and above 2 miles apart. In several places we attempted to land near the upper end, but found ourselves as often repulsed by a flat sandy shoal, which extended directly across. The land there seemed of a swampy nature, was thinly wooded, and through it was the appearance of a shallow rivulet falling into the sea; farther back it was more elevated, and the surrounding country being covered with timber, made us conclude that it was fertile."

At about 9 miles within the entrance of Possession sound is Allan point, the southern extremity of Camano island. This island is nearly 14 miles long, and its upper part is joined to the shore by a track of swampy land, through which a small stream flows; behind this the country is more elevated, and covered with timber.

Port Susan.—On the east side of Camano island is port Susan, which extends 11 miles to the north-westward, and has deep soundings all over it, excepting at its head, where is the swampy land just noticed, which is fronted by a quantity of kelp.

On the eastern side of the entrance to this port is a small bay, into which flow two excellent streams, but so nearly on a level with the sea, that Vancouver could procure water only at low tide, or at some distance up the brook, which latter was easily effected, as the boats could go up as far as where the fresh-water fell from the elevated land.

Port Gardner is on the west side of Camano island, and is merely a reach of Possession sound; in it there is deep water of 30 fathoms, and good shelter from all winds. In the western part of the port there is a deep bay, extending into Whidbey island about 5 miles, the shores of which, with the exception of some rocks off the eastern shore at the entrance, are believed to be clear of sunken dangers. From port Gardner the trend of the sound is towards the N.W., about 8 miles, to Penn cove.

Penn Cove is an inlet on the east side of Whidbey island. It is a very excellent and commodious harbour, and has regular soundings of 10 to 20 fathoms, good holding-ground. The extent of the cove is about 5 miles, and when within there is shelter from all winds. The head of the cove is not more than a mile from Partridge point, the western extremity of the island, so that the island is here nearly divided. On each point of the harbour Vancouver found, in 1792, a deserted village.

From Penn cove, Possession sound runs northward about 8 miles, and has a very contracted channel, although deep enough for vessels. From the eastern shore an extensive flat runs out nearly over to Whidbey island, and narrows the channel to the

width of about three-quarters of a mile; on this flat there are several islets and rocks. In the northern part of the sound is the entrance to Deception passage; and between Fidalgo island and the main is a narrow tortuous channel over the marshes, leading into Bellingham bay, fit only for boats.

Vancouver (1792) says of Penn-cove:—"The surrounding country, for several miles, from most points of view, presented a delightful prospect, consisting chiefly of various meadows, elegantly adorned with clumps of trees; amongst which the oak bore a very considerable proportion, in size from 4 to 6 feet in circumference. In these beautiful pastures, bordering on an expansive sheet of water, the deer were seen playing about in great numbers. Nature had here provided the well-stocked park, and wanted only the assistance of art to constitute that assemblage of surface which is so much sought in other countries, and only to be acquired by an immoderate expense in manual labour. The soil principally consisted of a rich black vegetable mould, lying on a sandy or clayey substratum; the grass, of an excellent quality, grew to the height of 8 feet, and the ferns, which, in the sandy soils, occupied the clear spots, were nearly twice as high. The country in the vicinity of this branch of the sea is, according to Mr. Whidbey's representation, the finest we had yet met with, notwithstanding the very pleasing appearance of many others; its natural productions were luxuriant in the highest degree, and it was, by no means ill supplied with streams of fresh water. The number of its inhabitants he estimated at about 600, which I suppose would exceed the total of all the natives we had before seen; the other parts of the sound did not appear by any means so populous, as we had been visited by one small canoe only, in which were five of the natives, who civilly furnished us with some small fish. The character and appearance of the several tribes here seen did not seem to differ in any material respect from each other, or from those with which we had already met."

In the bay westward of the north point of the entrance to Possession sound, there is a shoal at a short distance from the shore. It is generally visible, and is easily discovered by the soundings gradually decreasing to 10, 7, and 6 fathoms, so that it cannot be considered as any material impediment to the navigation of the bay.

HARO OR SAN JUAN ARCHIPELAGO.

Magnetic Variation in 1880,—about 22½° E. The annual increase is estimated to be 2 minutes.

Between the south-west end of Vancouver island and the main is the extensive group of islands known as the Haro or San Juan archipelago. It would not be consistent with the limits of this work to furnish a detailed description of all the islets composing this archipelago; so numerous are they that an inspection of the charts will alone give an adequate idea of their configuration, and of the winding channels which

separate them. We therefore refer our readers to the Admiralty charts (Nos. 2689, 577, 2840, 602, and 611,) and to the Vancouver Island Pilot, publications resulting from the survey of these waters by Captain G. H. Richards, R.N., during the years 1859 to 1866. The latter work contains a complete description of, and directions for, every anchorage and navigable channel among the islands.* The following *general* remarks upon the archipelago are from the report of the U.S. Coast Survey 1862. It is necessary to premise that the islands are separated from the Vancouver shore by a broad and very deep channel known as Haro strait; and from the main land by a passage almost equally broad, but not so deep, named Rosario strait.

The Boundary line of British and American territory runs through Haro strait, so that the whole of the San Juan archipelago belongs to the United States.†

HARO STRAIT.—The southern entrance to this strait may be said to lie between Discovery island and the point of San Juan island; here the strait is about 7 miles in width. Starting from this line and about 8 miles from Discovery island, a course N.W. by N. for 16 miles will run through the first stretch of the strait; thence an abrupt turn is made towards the eastward and the way out can be readily seen between the islands. The next course is N.E. $\frac{1}{2}$ E. for 11 miles; finally, N.N.W. $2\frac{1}{2}$ miles, and a run of 7 miles on that course will carry a vessel into the middle of the gulf of Georgin.

Commencing at the starting point, we have San Juan island to the eastward, and pass it at the distance of $1\frac{1}{2}$ miles. Its mountains rise to 1070 feet, and some of them are only partially covered with wood. The bluffs are very precipitous and inaccessible, and the depth of water close to them is as much as 150 fathoms. The greater extent of the strait is to the westward, stretching off into bays and passages among the islands. Cormorant bay is the only available anchorage about this entrance. It commences at Gordon head, $5\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from Discovery island; then stretches westward for 2 miles, and gradually curves to the N.N.W., with a long high bluff, broken and bright, at Cowichin head. Back of the south-west part of the bay rises a bold rocky-topped hill (named mount Douglas), which reaches a height of 696 feet. Fresh-water is obtainable on the southern shores of the bay. The northern limit of the bay is Darcy island, N. $\frac{1}{2}$ W. 4 miles from Gordon head, and on this course, $1\frac{1}{2}$ miles from the head, is Zero rock, a small white rock, showing a few

* We cannot too strongly recommend shipmasters bound to Vancouver island to furnish themselves with these excellent works by Captain Richards, R.N. The charts of Vancouver island and harbours with the inner waters, published by the Admiralty, are in about forty large sheets.

† The Oregon Treaty of 1846 divided the western part of the North American continent between the two countries by a line to be drawn along the 49th parallel of latitude. But in order to preserve to Great Britain the whole of Vancouver island and its harbours, &c., it was agreed that the boundary should go "to the middle of the channel which separates the continent from Vancouver island, and thence southerly, through the middle of the said channel and of Fuca strait to the Pacific Ocean." The interpretation of this clause of the Treaty subsequently gave rise to the well-known dispute between the two countries. The boundary line claimed by Great Britain was the strait eastward of San Juan archipelago, known as Rosario strait; that insisted on by the United States was Haro strait, lying to the westward of the archipelago. In the year 1872 the dispute was referred to the Emperor of Germany for settlement, who decided in favour of the United States.

feet above water, with plenty of water around it, but foul bottom and a patch of kelp a few hundred yards N.N.W. of it; $1\frac{1}{2}$ miles westward of it is a sunken rock. In the bay a depth of not over 20 fathoms is found, decreasing irregularly in advancing, but in the southern portion affording good holding ground in 10 fathoms water. At $1\frac{1}{2}$ miles E.S.E. from Gordon head are patches of kelp and foul bottom.*

When $8\frac{1}{2}$ miles within the entrance the width of the strait decreases to $8\frac{1}{2}$ miles, having Darcy island (low and wooded) on the west, with a small islet off its N.E. face, and very large fields of kelp stretching far off the south-east point into the strait. In one of these fields lies the Unit rock, a sharp-pointed rock, which uncovers 2 feet at low tides, and is situated three-quarters of a mile E. by S. $\frac{1}{2}$ S. from the south-east point of Darcy island.

Since the discovery of Unit rock several other rocks, distant about $1\frac{1}{2}$ to 2 miles E. by S. $\frac{1}{2}$ S. from the south-east point of Darcy island, have been found. They are marked by a field of kelp, and one point uncovers at the lowest tides. Near mid-channel a depth of 155 fathoms is found.

The island to the eastward, nearly abreast Darcy island, with a small cove at its southern end, is Henry island, having a high rocky precipitous front, and a whirling current around it. Farther on and to the westward is the south-east end of Sidney island, $1\frac{1}{2}$ miles northward of Darcy island, with the Dot rocks between them, but nearer Sidney island. This island is not high like those on the other side of the channel, and a landing is easily made at any point. The channel here, 10 miles from the entrance, is $2\frac{1}{2}$ miles wide; to the eastward it opens beyond the north end of Henry island, with high mountainous islands bounding the view; to the westward lie a couple of long narrow islands a mile from Sidney islands, and between them and the latter is good anchorage and capital fishing ground for halibut; that near the strait is named Halibut island. Some moderately low wooded islands lie 3 or 4 miles ahead, on the western side of the channel; between them runs the inside channel for steamers to the Nanaimo coal mines. The background of the view is occupied by wooded islands, overlapping each other and appearing like a continuous shore. The large high island on the eastern side, 15 miles from the entrance, is Stuart island, and the strait is here contracted to a breadth of only 2 miles, this being the narrowest part. At $2\frac{1}{2}$ miles W.S.W. from the western point of Stuart island is situated a rock covered at a quarter flood, and having irregular bottom around it for the space of half a mile, with soundings of 5 to 20 fathoms; another rock, which dries at half-flood, lies about 2 miles S.W. $\frac{1}{2}$ S. from the same point. At a mile north-west of Stuart island is a depth of 190 fathoms.

Stuart island in many places is very high and precipitous, and covered with timber, but in some parts sparsely. Near its south-west head a perpendicular wall of rock serves also to distinguish it. After passing the western end of this island at the distance of a mile, the channel takes an abrupt turn to the eastward, and the gulf of Georgia is seen. The course now is N.E. $\frac{1}{2}$ E. for 11 miles, having on the north-west side Saturna island, which rises into mountains. Monarch head, near the eastern

* Apparently on Johnstone reef (6 feet under water) of the Admiralty chart, No. 2689.

extremity of this island, stands up perpendicularly nearly 700 feet, but the extreme part of the island, known as East point, is a long sloping point, in many places destitute of trees. The island lying off its north shore is named Tumbo.

On the east side of the strait the waters open well to the south-east, and the islands rise in high hills and mountains. The large island opposite Monarch head, to the south-eastward is named Waldron; it has good anchorage off its south-west side, where the shore-line curves well in. The western point of the island is low and sandy; the southern, known as point Disney, is perpendicular, high and rocky. Off its northern face lie two islets, named Skipjack and Penguin; the western one, about a mile from Waldron, is moderately high, and wooded; the eastern is smaller, about 40 feet high, destitute of trees, but covered with grass; and lies a mile east of the former;—between these islets lies a sunken rock, and the current rushes by with great velocity.

When East point (Saturna island) bears N.W. by W. $\frac{1}{2}$ W., 2 miles distant, the west end of Patos island will bear N.N.E., $2\frac{1}{2}$ miles; and the west end of the Sucia group,* E.N.E. $8\frac{1}{2}$ miles; from this position a N.N.W. course for 7 miles leads out into the middle of the gulf of Georgia, passing between Patos island and East point, which are $2\frac{1}{2}$ miles apart. Close off East point is a depth of 120 fathoms, and off Patos island 170 fathoms. All these islands are moderately high, rugged, and covered with wood.

Plumper reef is distant about a mile W.S.W. from the south-west point of Sucia; it has less than 2 fathoms upon it, and is marked by a large mass of kelp.

The approximate geographical position of two or three points will serve to check the courses above given. East point of Discovery island, lat. $48^{\circ} 25'$, long. $123^{\circ} 14'$; west point of Stuart island, lat. $48^{\circ} 41' 17''$, long. $123^{\circ} 14' 30''$; and west point of Patos island; lat. $48^{\circ} 47' 8''$, long. $122^{\circ} 57' 81''$.

The number of islands and the intricate channels lying between Haro and Rosario straits we shall not attempt to describe. A proper appreciation of them can only be obtained from the chart.

ROSARIO STRAIT.—Rosario strait is the eastern of the two principal channels running through the Haro archipelago, between Vancouver island and the main. Its southern entrance lies N. by E., distant 7 miles from Smith island, and is $4\frac{1}{2}$ miles wide. The western point of the entrance is formed by cape Colville, which runs out from Walmouth hill;† this hill is 450 feet high and on the south-east part of Lopez island. Off this cape lie several rocky islets, with deep water among them and a rushing current. The outer one, named Colville island, is about 50 feet high, rocky, flat-topped, destitute of bush or tree, narrow, and about one-third of a mile in length, east and west; half a mile E. $\frac{1}{2}$ S. from it lies Davidson rock, which dries 4 feet at low water. A patch of kelp exists upon and around this rock, but the kelp is generally run under the surface of the water by the strength of the current.

The whole southern face of Lopez island is skirted by rocks and reefs. The island itself is very rocky and moderately low.

* Sucia signifies muddy. The harbour on the east side of it has a soft muddy bottom. The Indian name of the island is Choo-sa-nung.

† The Indian name is Noo-chaad-kwum.

On the *eastern* side of the entrance to Rosario strait is a small wooded islet known as Deception island, at the mouth of Deception pass, an intricate and very narrow 8-fathom channel, 8 miles long, running between the north end of Whidbey island and the south end of Fidalgo island. Distant about $1\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from Deception island is a dangerous sunken rock known as Lawson rock; the least water on it is 8 fathoms, and within a short distance from it the depth is 80 and 50 fathoms.

When at the southern entrance to Rosario strait, and $1\frac{1}{2}$ miles from the western side, a direct course of N. by W. $\frac{1}{2}$ W. for $19\frac{1}{2}$ miles will carry clear of everything from one end of the strait to the other. This course passes between Bird and Belle rocks, and almost touches point Lawrence, on Orcas island. Taking the courses through the mid-channel we have the following:—N. by W. $\frac{1}{2}$ W., $11\frac{1}{2}$ miles; N. by E. $\frac{1}{2}$ E., $8\frac{1}{2}$ miles; and N.W. $\frac{1}{2}$ W., $6\frac{1}{2}$ miles—making a total of $21\frac{1}{2}$ miles.

The shore for the first two miles on the western side is moderately high, declining to the point (cape St. Mary), a quarter of a mile off which lies Kellett ledge, bare at the lowest tides, and having deep water all around it; the ledge is marked by a mass of kelp. Thence the shore makes a deep bend for a mile to the westward, with a low beach and marsh, over which Lopez sound can be seen. This bend is known as Davis bay, and has 6 to 10 fathoms for a mile out, with level sandy bottom. In mid-channel of the strait rise the Bird rocks, about 80 feet high, consisting of three small rocky islets very close together, and running in a northerly direction. They are somewhat pyramidal in form, and during the summer show yellowish, on account of the parched grass and the colour of the rocks. Abreast them, on the western side, is Maury passage, a narrow opening into Lopez sound, between the two low rocky heads of Lopez and Decatur islands. The anchorage of Davis bay continues some distance northward of this opening, and abreast some moderately high white bluffs. N.N.E. three-quarters of a mile from Bird rocks lies the Belle rock, directly in mid-channel of the strait, and from its position very dangerous. It shows 4 feet above the lowest tides, and is covered by kelp. This rock is particularly dangerous on account of the strength of the tide, which runs over it 2 to 5 knots per hour; on all sides of it the water is very deep. The extent of rock above water is about 20 feet square. Between it and the Bird rocks there is a submarine ridge with plenty of water, but marked by strong eddies.

After passing Deception island, on the east side of the entrance, the face of Fidalgo island is high, precipitous, and bare for 2 or 3 miles in a north-west direction; this is named Sares head. It then sweeps to the north, changing to the westward until abreast and 2 miles from Belle rock. In the bight thus formed, known as Burrows bay, are several islands and shoals. Allan island is distant about $8\frac{1}{2}$ miles north-westward of Deception island; it is about three-quarters of a mile in extent, and 200 feet high, with its southern face partly bare; a quarter of a mile off its south-west face lies the Dennis rock, which is never bare, but its position is marked by a patch of kelp. Half a mile southward of Allan island is a cluster of rocky islets, 22 feet above high water, lying well off shore; they are known as Williamson rocks.

North of Allan island, and separated from it by a channel a quarter of a mile wide,

is Burrows island, $1\frac{1}{2}$ miles long S.E. and N.W. by half a mile in breadth. The island is between 600 and 700 feet high, and has a remarkably flat top, is wooded, and may be seen from the strait of Juan de Fuca. At the eastern end of the passage, between the last two islands, is a small one named Young island. Through all the channels formed by these islands a good depth of water exists, and no dangers have been discovered. Upon Fidalgo island rises mount Erie to the height of 1250 feet; it is covered with woods and presents a flat appearance from certain directions.

The breadth of Rosario strait at Belle rock is $8\frac{1}{2}$ miles; but it is soon contracted by James island, on its western side. James island consists of two heads a mile apart, and 250 feet high, but connected by a narrow ridge; the southern head is the higher, and not very heavily timbered;—close to the west of the ridge lies another head, connected with Decatur island by a low sand beach.

Immediately northward of James island is an opening on the west side of the strait between Decatur island and Blakely island, with a depth of 25 fathoms in it, but a rock, covered at a quarter flood, lies exactly in the middle of the entrance. The channel lying to the north-eastward of James island is known as the Bellingham channel; it is about 2 miles wide at its entrance, but a short distance within it is divided into two channels by Guemes island. Off the north entrance point, which is the south-west point of Cypress island, are some rocks and foul ground extending about half a mile in the direction of Burrows island. Around this locality extends a large body of kelp. The southern face of Cypress island consists of alternate perpendicular white cliffs, and sloping ground covered with fern or trees. On its western side, and $1\frac{1}{2}$ miles from the south-west point, is found a snug little harbour known as Strawberry bay,* off which is an outlying rocky islet named Strawberry or Hautboy island. In this bay excellent anchorage is found in 6 to 10 fathoms water, muddy bottom. Good fresh-water is abundant here. A high white cliff is seen to the south of the harbour, from the shores of which rise rapidly the Lake mountains to an elevation of 1525 feet.

Abreast the Strawberry island the strait contracts to a width of $1\frac{1}{2}$ miles, where the bold rocky face of Blakely island rises to a height of between 900 and 1000 feet; the greatest elevation of the northern part of the island is 1044 feet. Nearly half a mile S.E. from its east face lies a very small low rock known as Black rock, and half-way between it and the south end of the island is White rock, a quarter of a mile from the shore. In this narrow part of the strait the depth of water is about 60 fathoms, and the current rushes through furiously. When at anchor in 10 fathoms, under the low point $1\frac{1}{2}$ miles north of Strawberry island, the surveyors found the current running 4 miles per hour. Thence the strait widens northward, and at the north end of Blakely island, 2 miles above Strawberry island, two channels lead to the westward around Obstruction island, which lies between Blakely and Orcas islands; both are narrow, and off the entrance to the southern one lie some sunken rocks, and others above water. Blakely island and Orcas island are three-quarters of a mile apart.

When in the narrowest part of Rosario strait, a very marked perpendicular rocky

* The Indian name for Strawberry bay is Tutl-ke-teh-nas.

peak on the north end of Cypress island, is seen to the northward over the low point of Cypress island, and soon shows, rising abruptly from the water's edge to a height of 750 feet; it is known as Bald peak.* Abreast it the channel takes the first turn, changing its course to N. by E. $\frac{1}{2}$ E. for $8\frac{1}{2}$ miles. Half a mile off the north end of Cypress island is a small islet covered with trees, known as Rock island. A third of a mile W. $\frac{1}{2}$ S. from Rock islet is a dangerous rocky patch (with kelp), covering at half flood, named Cypress reef. The low island half a mile N.N.E. of Cypress island is Sinclair island, the highest part of which is towards the eastern end. Off the north-west face of Sinclair island, and stretching half a mile, is Panama reef, which is covered with kelp. Some parts of this reef uncover at half-tide; a large boulder stands on the inner part of the reef. From the western point of the island the reef bears North, distant three-quarters of a mile. On the north side of the island is anchorage in 10 to 15 fathoms water half a mile off shore.

Three miles from Sinclair island lies Orcas island, on the north-west side of the strait. It is a large mountainous island, broken by several extensive sands. The easternmost point, which is low, is known as point Lawrence; the low treeless islets and reef passed $1\frac{1}{2}$ miles before reaching this point, and lying over half a mile off shore, are the Peapods; deep water is found close to them. When upon this same mid-channel course, the island ahead is Lummi island; the southern half of this island is very much higher than the northern, and attains an elevation of 1560 feet. The rock, nearly 100 feet high, off the highest part of the ridge, and one-third of a mile from shore, is the Lummi rock, and a good boat harbour is found on its north-west side. A mile off the south end of the island are the Viti rocks, which are about 25 feet high, and have plenty of water around them.

Abreast point Lawrence the strait is more than 8 miles wide, and it there changes to N.W. $\frac{1}{2}$ W. for $6\frac{1}{2}$ miles to a line joining the Matia group with the north end of Lummi island. From point Lawrence, along the north face of Orcas island, the shore is rocky and precipitous, and rises by two or three plateaux to mount Constitution,† which is less than a mile in-shore and 2428 feet high. The geographical position of mount Constitution, as determined by the Coast Survey of 1864, is lat. $48^{\circ} 40' 87''$, long. $122^{\circ} 40' 1''$.

The course out from the strait passes on the west some rocky islets called the Sisters, marked by one or two stunted fir trees; then Clark island (with a little islet named Barnes close under its western side,) leaving a channel a mile wide between it and the north shore of Orcas island, with very deep water and no anchorage. Abreast Clark island, on Lummi island, is a contracted anchorage and shelter from northerly winds under a low point named Village point; the anchorage is in 10 to 15 fathoms, but there is no fresh-water, and the large Indian village is now deserted. After passing this point anchorage may be obtained at half a mile from shore in 8 to 15 fathoms water. Close to Clark and Barnes islands the depth is 50 and 60 fathoms, and a very strong current runs near them. The channel between Village point and these islands is 2 miles wide.

* The Indian name is Sheb-ung-tib, signifying the home of the Thunder-bird.

† The Indian name is Sheb-lagh.

W.S.W. from the north end of Lummi island, and 4 miles distant, are three islands very close together, called Matia. At $1\frac{1}{2}$ miles westward from them lies the Suecia islands, consisting of one large and six small islands, with a reef off the north side of the group, and enclosing a beautiful harbour a mile long and half a mile wide, opening to the east, and carrying 10 to 15 fathoms, sticky mud bottom. To the westward of this group lies Patos island, already mentioned on page 817.

The geographical position of the north end of Lummi island is lat. $48^{\circ} 44' 58''$, long. $122^{\circ} 42' 12''$.

The following geographical positions will serve to check the courses and distances given for sailing through Rosario strait:—Matia island, east end, lat. $48^{\circ} 44' 37''$, long. $122^{\circ} 48' 29''$; south end of Strawberry island, lat. $48^{\circ} 38' 34''$, long. $122^{\circ} 48' 27''$; and Colville island, off Lopez island, lat. $48^{\circ} 24' 53''$, long. $122^{\circ} 48' 34''$.

Alden Bank, 2 miles in extent north and south, and one mile east and west, lies in the centre of the northern entrance of Rosario strait; its southern limit is 2 miles north of Matia island, and there is a channel 3 miles in breadth between it and the eastern shore.

The depth of water on this bank varies from 3 to 7 fathoms, and in one spot as little as 14 feet is found; the bottom is in some parts rocky, with patches of kelp growing on it; in other parts it is sandy and offers convenient anchorage for vessels becalmed or waiting for tide. Vessels are recommended to pass on the eastern side of the bank.

General Remarks.—In consequence of the violence and velocity of the tidal currents the navigation of the locality just described is exceedingly difficult for sailing vessels, if becalmed. Throughout Haro strait the roar of the conflicting currents can be heard for miles, and the main current runs frequently 6 miles per hour. No anchorages exist in this channel, except at Cormorant bay; but it is free of known hidden dangers, except Zero rock, Kelp reefs, Unit rock, and the continuation of the reef off Darcy island.* It is 10 miles longer than Rosario strait, and makes a right angle in its course, but is a mile wider, and has much deeper water. Rosario strait is less curved, has several anchorages and known dangerous rocks, and a current of about $1\frac{1}{2}$ miles less per hour. For steamers, either channel, or even some of the intermediate channels, may be used; but for a sailing vessel Rosario passage is preferable, although the total distance from the middle of the strait of Juan de Fuca to the middle of the gulf of Georgia is 5 miles longer. The winds are apt to fail in both channels, and during summer frequent calms prevail.

Once in the gulf of Georgia, through either channel, the 3-mile face and timber-covered bluffs of point Roberts (showing almost as an island) is seen to the north-west. On the west the mountains of Vancouver and its bordering islands rise up precipitously, and on the eastern or main shore a series of wooded cliffs 200 feet high. Far to the eastward the Cascade range is seen rising above intermediate ridges, with the snow-covered summit of mount Baker, which rears its head 10,900 feet above the sea. To the W.N.W. stretch the waters of the gulf of Georgia, 9 miles wide abreast of point Roberts, where it is narrowest, but spreading out to 20 miles, and having a

* For the positions of these dangers, see the chart.

length of 120 miles. A short distance above the 49th parallel it receives Fraser river (the third great stream of the north-west coast of America), the branches of which spread towards the Cascade range of mountains.

If bound up the gulf, vessels hold well to the eastern shore to avoid the rushing currents, and to take the chances of an anchorage if the wind fail.

GULF OF GEORGIA.

EASTERN SIDE TO BURRARD INLET.

Magnetic Variation in 1880:—In Bellingham Bay $22\frac{1}{2}^{\circ}$ E.; entrance of Fraser River 28° E.; Burrard Inlet $28\frac{1}{2}^{\circ}$ E. It is estimated to increase about 2 minutes annually.

BELLINGHAM BAY.—After leaving Rosario strait, the course upon entering Bellingham channel, southward and eastward of Cypress island, is N.E. for 2 miles. The width is at first 2 miles, it then decreases to a mile upon turning sharp around the south-east point of Cypress island; to the eastward are seen the bluffs of Guemes island. Between these two islands the channel runs about 8 miles on a N. by W. $\frac{1}{4}$ W. course. Abreast the north end of Guemes island (which is a steep bluff), and on the west side of the channel, are several small high wooded islets, known as the Cone islands. The moderately low wooded island facing the channel is named Sinclair; vessels pass between the south-east point of it and the north end of Guemes island. The island 2 miles to the N.E. is Vendovia. Pass north of Vendovia island, but south of the small islet (off Eliza island), which is 2 miles N.E. by N. from the north-west point of Vendovia island, and the southern part of Bellingham bay opens to the south-east;—its northern part opens to the N.N.W.

If the current be flood and the wind light, keep close around Guemes and Vendovia islands, so as not to be set past Sinclair island. The low bare rocky islets, $1\frac{1}{4}$ miles N.W. of Vendovia, are the Viti rocks; and the point between them and Eliza island is the southern extremity of Lummi island. From the islet last passed, a point on the eastern shore lies nearly North 5 or 6 miles distant. Run past this and follow the trend of the shore for 2 or 3 miles to the deepest part of that part of the bay, when houses, &c., will denote the position of the mines and the villages of Sehome and Whatcom. Half a mile from shore is good anchorage in 4 fathoms, soft bottom, and the bay there is very smooth.

The general direction of Bellingham bay is S.E. and N.W.; its width 8 miles and length 14 miles, extending from lat. $48^{\circ} 88'$ to lat. $48^{\circ} 48'$. The depth of water ranges from 8 to 20 fathoms, with good sticky bottom.

We believe there are several companies mining here, but the amount of coal obtained is not great, and its quality is not considered good.

The north-west channel into Bellingham bay is between Lummi island and the shore.

At rather more than 2 miles from the north end of the island, in a N. by W. direction, is Sandy point, a low point projecting from the main land. From Sandy point to point Whitehorn the general trend of the shore is N.W. $\frac{1}{2}$ W., and the distance 7 miles. The shore is a steep bluff, about 150 feet high, and covered with wood. At Whitehorn point the face of the point is worn away by the action of the sea, and shows bright, with rocks at its base.

Birch Bay.—The southern point of this fine bay is point Whitehorn, and the north-west shore is formed by a long rounding high bluff, bearing about N.W. from Whitehorn point, and distant 3 miles. The bay runs N.N.E. $2\frac{1}{2}$ miles, with a width of $1\frac{1}{2}$ miles. The bottom is very uniform, with good holding-ground of soft mud in 4 to 10 fathoms. The immediate shores are low, and edged with marshy patches, thick undergrowth, and heavy wood. No directions are necessary for entering, as there is a depth of 15 to 20 fathoms a mile outside, and 10 fathoms water on the line of the entrance. During the heaviest south-east weather no swell is felt here in a properly selected anchorage. Search has been made for fresh-water, but none found in the space of more than a mile along its south-eastern side. The approximate geographical position of point Whitehorn is lat. $48^{\circ} 58' 7''$, long. $122^{\circ} 40' 27''$. The Indian name of the point is Tsan-wuch.

Drayton Harbour.—Passing the bluff N.W. of Birch bay the shore trends about N.N.E. for nearly 8 miles, and terminates in a long low sandy point, behind which lies Drayton harbour—a small land-locked bay having a depth of 10 fathoms just inside the entrance, but very shoal over nine-tenths of it. It opens to the north at the extremity of the sandy point. With the end of the point bearing N.W. by W. $\frac{1}{2}$ W. half a mile distant, the anchorage would be in 6 fathoms. South of this position it shoals gradually for over half a mile to 12 feet, with sticky bottom.

The approaches to the bay do not show over 5 fathoms at a distance of a mile from the shore, and the same depth is found on gradually nearing the end of the low point. The south-east shore of the harbour is flat and marshy, and is not separated by much more than a mile from Birch bay.

In this harbour the United States and British steamers attached to the North-western Boundary Survey were accustomed to anchor (1857). The American commissioner encamped on the bluff about a mile north of the boundary, the site having been selected on account of fresh-water, but it has an extensive flat in front.

Semi-ah-Mee Bay.—This extensive bay stretches 8 or 4 miles to the westward of Drayton harbour, and is bounded on the north by a bluff from 300 to 400 feet high, covered with fir. The bottom is very regular, and the depth ranges from 10 fathoms about 2 miles south of the bluffs, to 3 fathoms within half a mile of them.

Tides.—The corrected establishment of the port is 4h. 50m. The mean rise and fall of tides is 5.9 feet; of spring tides, 10.9 feet.

Stretching to the north-west from this bay is a large shallow marshy bay, fringed with trees and bushes. From its northern shore low land extends as far back as Fraser river. The western boundary of the bay is formed by the eastern shore of point Roberts. It is named Mud bay on the United States Coast Survey map.

Point Roberts.—When seen from the northern entrance of Haro and Rosario straits;

this point stands out near the middle of the gulf of Georgia as a bold wooded island. From Rosario strait the south-western point bears nearly N.W. by W. about 18 miles. From point Whitehorn it bears West distant 12 miles.

On the outer or gulf of Georgia side of point Roberts the shore runs about N.W. $\frac{1}{2}$ W. for 9 miles to the southern and principal mouth of Fraser river. To the mouth of the river at the outer edge of the Sturgeon bank the bearing is W. by N. and distance $9\frac{1}{2}$ miles. The south face runs E.N.E. $2\frac{1}{2}$ miles, and presents for nearly the entire distance a bold bluff about 150 feet high, and covered with wood. Half a mile off this shore anchorage may be had in from 10 to 15 fathoms, but in southerly weather it must be avoided. The eastern shore of the point runs nearly parallel with the western for 4 or 5 miles. Off the south-east point rocks and foul bottom stretch out S.E. for quite a mile. The geographical position of the south-western point, as determined by the United States Coast Survey, is lat. $48^{\circ} 58' 15''$, long. $128^{\circ} 4' 16''$. It is therefore nearly 2 miles south of the north-western boundary of the United States. Between this station and the bluff lies a marsh.

FRASER RIVER.—Fraser river,* in point of magnitude and commercial importance, is second only to the Columbia river, on the north-west coast of America. This river is comparatively free from risk of life and shipwreck, because its waters are received by a sheltered strait, scarcely 15 miles across; and the neighbouring island of Vancouver serves as a natural breakwater, preventing the possibility of any sea arising which would prove dangerous to vessels even of the smallest class, unless they ground.

The river, with its numerous tributaries, has its rise in the Rocky mountains, between 400 and 500 miles from the coast in a northerly direction, whence it forces its way in torrents and rapids, through one of the many great parallel valleys which intersect this region, confined by gigantic mountains, with large tracts of country, rich in agricultural resources on either side of them, until it reaches the town of Hope, which is about 80 miles by the windings of the river, in an easterly direction from its entrance.

Above the city of Lytton, which stands at the fork or confluence of the Fraser and Thompson rivers, 55 miles above Hope, many rich deltas occur, or as they are termed by the miners, bars, and among these known as the wet diggings, gold was first discovered in British Columbia.

At Hope the river assumes the character of a navigable stream; steamers of light draught reach this point and even the town of Yale, 15 miles above it, during 6 to 9 months of the year. In June, July, and August, the melting of the snow causes so rapid a downward stream that vessels of even high steam power are rarely able to stem it, and during these months numbers of large trees are brought down from the flooded banks, which offer another serious obstruction to navigation. Between

* These remarks are from the *Vancouver Island Pilot*, edition 1864. A lightvessel is now moored at the entrance to the river, in about 10 fathoms water. The light, *fixed*, can be seen from a distance of 10 miles. A bell is sounded in foggy weather. From it Garry point bears N. by E. $\frac{1}{2}$ E. easterly, distant 5 $\frac{1}{2}$ miles; North Sand head buoy, N.N.W. $\frac{1}{2}$ W. 7 cables; and the South Sand head buoy, E.N.E. 2 cables.

Hope and Langley the latter 80 miles from the river's mouth, there is always a considerable strength of current, from 4 to 7 knots, at times more ; but at Langley the river becomes a broad, deep, and placid stream, and except during the three summer months the influence of the flood stream is generally felt, and vessels of any draught may conveniently anchor. The depth is 10 fathoms ; the current not above 3 knots.

Midway between Langley and Hope the Harrison river falls into the Fraser and by it and a long chain of lakes extending in a general N.W. direction, a comparatively easy route has been established, by which the upper Fraser is reached at a point just below the Bridge river, in the heart of the gold region, thus avoiding that difficult and at present almost impassable part of the country between the town of Yale and the Fountains, by the main river a distance of about 90 miles.

Vessels of moderate size may enter the Fraser river near high water, and proceed as high as Langley with ease, provided they have or are assisted by steam power. The only difficulty is between the Sand heads and Garry point, the entrance proper of the river, but while there are competent pilots and the buoys remain in their positions, this difficulty disappears. It must be remembered, however, that the tides of the strait of Georgia sweep across the channel of the entrance, and a large ship is recommended to enter or leave with the last quarter of the flood.

The great quantity of deposit brought down by the freshets of summer has created an extensive series of banks, which extend 5 miles outside the entrance proper of the river. The main stream has forced an almost straight though somewhat narrow channel through these banks,* and at its junction with the current of the strait of Georgia, which runs at right angles to it, has caused the wall-edged bank before alluded to, extending to Roberts point on the south, and Gray point on the north.

The river is at its lowest stage during the months of January, February, and March. In April it commences to rise from the melting of the snows, and is perhaps 2 feet above its lowest level ; the flood stream is strong enough to swing a ship at New Westminster up to the end of this month. In May the water rises rapidly, the river is at its highest about the end of June, and remains up with trifling fluctuations until the end of July or middle of August. During these six weeks the banks are overflowed, and extensive plains above Langley are covered for a space of several miles ; the strength of the stream between Langley and Hope being from 4 to 7 knots, and in the narrow parts even more. The usual rise of the river at Langley due to these floods is about 14 feet, but from the testimony of an officer of the Hudson's Bay Company, who has resided more than 80 years there, it has been known to reach 25 feet.

From the middle to the end of August the waters begin to subside, and in September the stream is not inconveniently strong. September, October, and November are favourable months for the river navigation, as the water is then sufficiently high to reach Hope, and the strength of the current considerably abated. The shallow stern-wheel steamers have got to Hope as late as December ; between this month and April,

* The channel over the sands at the mouth of Fraser river (in 1876-7) continued to scour to the northward, and was more tortuous than formerly ; it would not be unattended with danger to attempt to take a vessel to or from New Westminster with a greater draught than 14 feet. *Hydrographic Notice*, No. 1, 1880.

owing to the shoalness of the water and the great quantity of ice formed, navigation, even by these vessels (only drawing 18 inches) is attended with great difficulty, and rarely practicable at all. The snags or drift trees which become embedded in the river, also form a serious obstacle to navigation at this season.

In April the steamers commence again to run; in June, July, and August the rapidity of the current is the great obstacle, but these high-pressure vessels (commanding a speed of 11 and 12 knots) frequently accomplish the voyage, though at much risk.

The Harrison river route (page 825), obviates some, but not all these, difficulties. At New Westminster the freshets raise the level of the river about 6 feet, but the banks being high no inconvenience is felt and the strength of the stream is rarely 5 knots, during the winter 2 to 3 knots; for some miles within the entrance the low banks are partially flooded for a month or six weeks. The rise and fall due to tidal causes is 8 to 10 feet at springs, between the Sand heads and the entrance of the river proper at Garry point; at New Westminster it is 6 feet, and at Langley scarcely perceptible.

Directions.—There are no natural marks sufficiently well defined, or which are not too distant, or too liable to be obscured in cloudy weather, to enable a vessel by their help alone to hit the narrow entrance between the Sand heads with accuracy. A large spar buoy is placed on the south Sand head, and the northern edge of the channel within is marked by similar buoys, somewhat smaller, for the colour of which see chart; the Sand head buoy can be seen well at a distance of 2 miles.

To make the entrance of the river approximately, the following bearings will be found useful. From the eastern entrance of Active pass, which is now the usual route for steamers from Vancouver island, the entrance bears N. by W. $\frac{1}{4}$ W., 11 miles; from the entrance of Portier pass, which shows as a very distinct gap between Galiano and Valdes island, the entrance between the Sand heads bears N.E. $\frac{1}{4}$ E. distant $11\frac{1}{2}$ miles; and when that gap bears S.W. $\frac{1}{4}$ W., and the extreme of the trees on Roberts point spit E. $\frac{1}{4}$ S. a vessel will be within one mile of the entrance, and should have from 45 to 50 fathoms water.

Mount Provost, a remarkable sharp peak on Vancouver island, kept on a bearing S.S.W. $\frac{1}{4}$ W., will also lead for the Sand heads. In coming from the northward, Passage island, at the entrance of Howe sound, kept on or just open of a remarkable peak on Anvil island within the sound, bearing N. by W. $\frac{1}{4}$ W., will clear the edge of the Sturgeon bank until the bearings just given are brought on for entering.

When at the entrance a remarkable solitary bushy tree will be seen on Garry point, the northern entrance point of the river proper, strait for which is the general direction of the channel; it bears from between the Sand heads N.N.E. a little easterly, and is just 5 miles distant.

To proceed up the river strangers are recommended to obtain a pilot's assistance, as the channel over the bar has grown shallower than formerly and more tortuous; see note at foot of page 825.

New Westminster, the capital of British Columbia, stands on the north or right bank of the Fraser river, just above the junction of the North Fork, and 15 miles in a

general north-easterly direction from the entrance proper. It occupies a commanding and well chosen position, being within an easy distance of the entrance, and having great facilities for wharfrage along its water frontage, a good depth of water, and excellent anchorage.

The river bank is somewhat precipitous in places, and the country at the back is like all the lower parts of the Fraser (unless, indeed, in the immediate neighbourhood of the entrance, where it is swampy grass land, subject to inundation during the freshets of summer) densely wooded; a considerable clearing, however, of the timber has taken place in the vicinity of the town, which already assumes a prominent and thriving aspect, and when the facilities for entering the river and its capabilities are better known, will no doubt rise more rapidly into importance.

The camp of the Royal Engineers, a mile above New Westminster, is a most picturesque spot, commanding an uninterrupted view of the Queens reach, a broad, deep, and magnificent sheet of water. From the camp to port Moody, a harbour at the head of Burrard inlet, the distance is 4 miles in a north direction; a good trail exists between the two places, and a waggon road is in course of construction to the outer harbour of the inlet, which, when completed, will be an important work. At 5 miles eastward of New Westminster is the entrance to the Pitt river, which runs in a general direction from N.N.E. to N.E. for 28 miles, terminating in two remarkable lakes enclosed between almost perpendicular mountains, and navigable to the head for vessels of 14 feet draught, the depth in places being far too great for anchorage. A large tract of low grass land lies on both sides of the entrance of the Pitt, which, however, is generally overflowed, or partially so, during six weeks of summer.

Derby or New Langley is 12 miles above New Westminster in an easterly direction, on the south or opposite side of the river; the channel between is deep, and there are no impediments to navigation. This spot was first selected as the capital, and as a town site it is unobjectionable, having a considerable tract of good cleared land in its neighbourhood, and all the requirements of a commercial port; the depth of water here is 10 fathoms. Large vessels may proceed with ease 7 miles beyond Langley, the navigation then becomes somewhat intricate, and the current too rapid for any vessels but steamers of light draught and great power.

North Fork.—This is another entrance to the Fraser, navigable for vessels drawing 6 to 8 feet water, and is generally used by the natives proceeding to or from Burrard inlet. Its junction with the main stream occurs immediately below New Westminster, whence it runs in a westerly direction, and enters the strait of Georgia through the Sturgeon bank, about 5 miles northward of the Sand heads; a low island, partially wooded, lies in its entrance, and splits the channel into two arms.

In many parts of the North Fork the water is deep, in holes, and the bottom irregular; it can only be considered a boat channel.

BURRARD INLET.—This is the first great harbour which indents the shores north of the 49th parallel. Its entrance, which is between Grey point on the south and Atkinson point on the north, is 14 miles N.N.W. from the Sand heads of Fraser river. Howe sound immediately adjoins it to the north, Atkinson point being the eastern limit of the sound. Burrard inlet is extremely easy of access to vessels of any size,

and possesses convenient anchorage in almost every part of it. It is divided into three distinct harbours, viz., English bay or the outer anchorage, Coal harbour above the first narrows, and port Moody at the head of the eastern arm of the inlet.

Light.—A light revolving every minute is exhibited from a square white tower, on point Atkinson, the north entrance point of Burrard inlet; it is 119 feet above the sea and visible (over an arc of 87°) 15 miles. Position, lat. $49^{\circ} 19' 40''$, long. $128^{\circ} 15' 55''$.

SOUTH-WEST COAST OF VANCOUVER ISLAND.

Magnetic Variation in 1880:—Near Barclay Sound 28° E.; Nootka Sound $28\frac{1}{4}^{\circ}$ E.; Cape Cook $2\frac{1}{4}^{\circ}$ E.; Scott Islands $24\frac{1}{4}^{\circ}$ E. It is estimated to increase about 2 minutes annually.

GENERAL REMARKS.*—Vancouver island, first made known to us by Captain Cook, is situated between latitudes $48^{\circ} 20'$ and 51° , longitudes 123° and 128° . It is separated on the south from Washington territory by the strait of Juan de Fuca, and on the east from British Columbia by the gulf of Georgia, and by Johnstone strait. Essentially a mountain ridge, its buttress-like walls descend for the most part abruptly to the shore, fringed, however, in many places, more especially on its south-eastern and eastern sides, by the undulating country, thickly wooded in general, but here and there containing patches of open grass-land.

The island is of an elongated oblong form, nearly 800 miles in length, by 80 to 50 miles in breadth, attaining, at mount Victoria in lat. $50^{\circ} 8\frac{1}{4}'$, long. $126^{\circ} 9'$, an elevation of 7484 feet. Its outline is boldly picturesque; its shores are characterised by abrupt cliffs, rocky promontories, sheltered coves, pebbly beaches, and fine harbours.

The whole western side presents a dreary aspect. Numerous arms of the sea, fiord-like in character, penetrate between the walls of metamorphic and trappean rock, which, on either hand, rising into lofty peaks and ranging into broken sierras, or sloping from rounded dome-shaped masses, form the buttresses of the land, opposing and resisting the fury of an ocean, for the greater part of the year anything but pacific. Along the eastern side a more open and more undulating country marks the existence of underlying sedimentary rocks, which, in the form of carboniferous sandstones and limestones, at intervals fringe the coast.

The whole country is more or less densely wooded, excepting just where the summit of a mountain affords no hold for plants, or where, as in the neighbourhood of Sooke, Victoria, Cowitchin, and Comux, limited ranges of open grass-lands occur.

The surface is diversified by mountain precipices, hill and dale, wide-spreading lakes,

* These interesting remarks upon Vancouver island are chiefly extracted from the Journal of the Royal Geographical Society, 1864. See also an article on the same subject in the *Mercantile Marine Magazine*, 1867.

and solitary tarns, cut up by numerous arms and inlets of the sea; in no case does the water-shed suffice to give a navigable stream. There are no rivers, in the stricter sense of the word, such streams as flow through the country being simply the short watercourses, which discharge the overflow of lakes or the surface-waters of the neighbouring ridges—torrents in winter, nearly dry in summer, valuable only as a power for driving grist and saw-mills.

As might be expected in a country having a clay subsoil and covered with material through which water readily percolates, springs are numerous and the water excellent. Where the clay, however, forms the surface-soil, some inconvenience is experienced, as in the neighbourhood of the town of Victoria.

The remarkably low temperature which characterises, all the year round, the ocean that washes the shores of this island, has a considerable influence on the climate; this ocean is boreal in character, its temperature being kept low by Arctic currents which sweep down the coast, even to below the latitude of San Francisco, and by the quantity of melting snow discharged by numerous rivers and mountain torrents on the British Columbian coast.

Climate.—The climate of Vancouver, in the succession of its seasons and general thermal conditions, approximates closely to that of Great Britain, modified by special circumstances connected with its physical geography. Situated close to a continent, the mountain ranges of which are clothed or capped with perpetual snow, and surrounded by an ocean remarkable for its extremely low temperature, certain peculiarities present themselves to the notice of the climatologist; and these are well and specially marked in the south-east end of the island, owing to its proximity to the Olympian range of mountains in Washington territory. This range, running east and west, presents its northern aspect to Vancouver island; and since, on this aspect, the snow remains on the mountain peaks all the year round, the winds which blow from this direction are necessarily cold and chilling. Other winds, blowing over the cold sea water, also have this chilly feeling, and give this peculiarity to the climate, as far on in the year as the 21st of June, of a fine clear atmosphere with a bright sun and cold winds, like a late spring in England.

The seasons in general take the following course:—After the gales with rain, which generally mark the period of the equinox, fine clear weather sets in, and continues till about the middle of November. At this period rain begins to fall continuously for days, and gales of wind are frequent on the coast.

The barometer ranges from 29·50 to 30·10, and falls rapidly on the approach of a southerly gale. Rising gradually to 30·20 and 30·50, a northerly wind springs up, and 3 days of fine clear weather, with hoar-frost generally follow. After the third day, the barometer slowly falls, and again the gale springs up, and the rains come down, to be succeeded, after a few days, by a rising glass and frosty weather, which, as the season advances, occasionally becomes intense, and is accompanied by hail and snow. The latter seldom lies for any length of time; the winters of 1852-53, 59-60, and 61-62, the last especially, being remarkably severe exceptions. These exceptional seasons occur in all climates, and here prove the rule that an open wet winter characterises Vancouver island.

There is a great amount of rain, but it is to be regretted that there is no register to show what the rainfall actually is.

The great quantity of uncleared and undrained land tends to make the spring later and colder than in England. The summer is drier, with a more scorching sun. Little or no rain falls from the middle of April till the Equinox, or the end of October. The prevailing winds during these summer months are from south-west to north-west, blowing freshly during the day, the nights tranquil and clear. Northerly winds occasionally prevail, and, blowing over the heated land, are, in the southern parts of the island, hot and dry.

The autumn of the American climate is finer than that of the European, and the fine weather (the Indian summer) extends farther into the year. The winter months in ordinary seasons are much the same as in the west of England; in the severer and exceptional, more like the Midland Counties and east coast of Scotland. There are thus, as it were, two seasons, a wet and a dry. The rainfall, it may be noted, is greatest at night. On the whole, the climate of Vancouver may be fairly described as very fine, healthy, and enjoyable.

In ordinary seasons the Isothermal line (line of equal temperature) of Vancouver island would pass through the southern counties of England. Taking the average annual maximum temperature at London in June as 86°, the minimum as 22° Fahr. in January, the range will be 64°. In Vancouver, the maximum temperature for the year is 84° in June, the minimum 14½°, which gives a range of 69½° Fahr. But this fall to 14½° for a day or two in December must be looked on as exceptional, and the usual minimum standard of 22° Fahr. accepted; this gives a range of 62° Fahr., almost the same as that of London.

The register kept on shore has been taken in preference to one kept on board, in making the above comparison, the conditions being more equal; for it must be borne in mind that, strictly speaking, there are two well-marked climates in Vancouver, viz., a littoral and an inland climate: the former, due to the causes already mentioned, cold arctic currents, &c., &c., has a lower range, as shown by registers kept on board ship.

The whole area of Vancouver island comprises about 12,000,000 acres, the greater proportion of which is mountain and barren rock.

Following the districts as herein set down, it will be interesting briefly to set forth their special characteristics and capabilities.

Of the surveyed districts, beginning at the south-eastern extremity of the island, *Sooke* first claims our attention, and it will be found to possess some feature of considerable importance. Situated advantageously and conveniently on the strait of Juan de Fuca, but for difficulties connected with the approach from seaward to its magnificent inner harbour, this district must have long ago assumed a position commercially of high importance. There is reason to believe that these difficulties may in time be overcome, and by the aid of steam-tugs vessels may be safely anchored in a harbour safe and land-locked.

A carboniferous deposit in this district has been proved by "bore" to the depth of 84 feet, and two thin seams of coal have been passed through. A promising vein of copper has been found, and is now being worked.

Esquimalt district contains 12,426 acres. The soil, generally, is poor in quality, covered with scrubby timber, a great deal of rock, and many lakes and large swamps. The great importance of this district consists in its excellent harbour, described on p. 291.

The village or hamlet of *Esquimalt* consists of a few scattered houses, chiefly hotels, dependent for support on the mail-steamers and ships of the royal navy there stationed.

The districts of *North* and *South Saanich* contain respectively 10,767 and 12,216 acres. These districts contain some of the best agricultural land in Vancouver. There are indications of copper, and a coal-seam of inferior quality crops out on the eastern coast.

The district of *Nanaimo* has a very important geographical position, and possesses a very interesting, and economically valuable, geological history.

The working of the valuable coal-field of *Nanaimo* has been carried on very irregularly; and only of late have any steps been taken on a scale commensurate with its importance.

Rising behind the settlement of *Nanaimo*, is mount Benson, a trappean mass, attaining the height of 3866 feet.

On Chase river, which flows along the south-eastern spur of mount Benson, are three outcrops of coal. The Douglas seam, now being worked, furnishes the best coal as yet taken out, and is reported as most favourable, both by analytic chemists and practical men.*

Nanaimo settlement is prettily situated. The site of the town is now (1867) being laid out which will probably soon be a port of entry.†

The *Valley of the Comux*, another fine agricultural district, as yet unsurveyed, lies north of *Nanaimo*. Its special characteristic is the existence of successive terraces of open prairie-like land, marking separate periods of slow upheaval. But, partially explored, no further special account of its capabilities can be given than that, in its general character, it closely resembles the Cowitchin valley.

Proceeding north and west, passing *Valdes* island, and through *Johnstone* strait, an excellent route for steamers, abounding in good anchorages, the extreme north-west point of the island is reached, where fort *Rupert*, a trading station of the *Hudson Bay Company*, is established.

The western coast of the island, commencing at cape *Scott*, possesses a great number of remarkable and interesting features. From this cape a group of islands extends westerly for 26 miles. Between the cape and the nearest islands there is a good clear passage 10 to 80 fathoms deep.

* The excellent quality of this coal is now indisputable. It yields a hard, lustrous, fissured, and little swollen coke. It contains little hygroscopic moisture, and burns well, with a steady heat and a brilliant flame—spec. grav. 1.817. Its steaming properties have been very favourably reported on by the engineers of H.M. ships and other vessels on the coast. In stowage, Welsh coal has the advantage over it of about 12 per cent; Newcastle (English) 2 per cent.; but with most north country coal, and all Scotch, the advantage would be in favour of *Nanaimo* coal (*Douglas* seam) by 2 per cent.

† A lighthouse has recently (1876) been erected on *Entrance* island, on the south side of the entrance to *Nanaimo* harbour. The light is fixed white, visible 14 miles. Position lat. $49^{\circ} 19' 50''$, long. $123^{\circ} 48' 45''$.

Immediately south of cape Scott is Quatsino sound, an important inlet, stretching across the island nearly to fort Rupert, on the eastern side. Coal has been found here, which with other resources, copper and fine timber, and so forth, will make this a place of importance.

Cape Cook separates Quatsino from Kyuquot, a district which extends to Nootka sound. This latter is a deep inlet, possessing few harbours or good anchorages. The small harbour or cove at its entrance is famous as the scene of the Spanish occupation dispute, and an anchorage nearly opposite has a special interest as having been Cook's first.

Clayoquot sound differs from all the other inlets of this coast, its entrance being full of banks and shoals of sand and gravel, instead of a deep muddy bottom. This region is probably rich in mineral wealth.

Barclay sound, situated close to the entrance of the strait of Juan de Fuca, has a very important geographical position. It is a somewhat open sound, studded with numerous islands, it possesses several good anchorages, one within very convenient distance of cape Beale, on which a lighthouse has recently been erected. At the upper end of the sound a very remarkable cleft in the mountain-range, known as the Alberni canal, leads to a level country of considerable extent, heavily timbered, with the finest specimens of pine and other woods perhaps anywhere to be seen. Through this flows a stream, discharging the waters of a chain of lakes, which penetrates northerly into the interior. The anchorage is good, and the whole sound, canal, and harbour, can nowhere be excelled in the facilities they afford for the protection and defence of commerce.

Such is the general character of Barclay sound. Its political and commercial importance merit a more special detail. The Alberni canal is entered through the Devil's gap, the rocky sides of which run so sheer down into the deep water that the largest ship could make fast alongside to the pine-trees, the shores on either hand not being more than a pistol-shot apart. The convenience of the Devil's gap for refitting ships is great; timber for masting or repairing purposes being plentiful. There is also plenty of fair farming land, and fresh-water in abundance.

The high and rocky sides of the Alberni canal end on the right hand with a bold outstanding rock, known from its colour as Copper mountain; and from it the canal opens into a wide oval-shaped basin, at the far end of which the buildings of the Alberni settlement are seen. The river Somass runs into this basin, and at the junction there are considerable flats of good meadow-land.

Several schooners and other vessels have been built at Alberni. Fish curing has been carried on to some extent; the abundance of salmon and cod in the neighbourhood making this a favourable place for such operations. A coasting trade is carried on with the Indians for furs, oil, fish, and so forth.

A great portion of the area of Vancouver island is unavailable land, perhaps four-fifths of the whole being barren rock. Heavy and very valuable timber now covers many fine districts, which, as they become cleared, will become available for cultivation. The expense of clearing is at present great, from £6 to £14 per acre. The richer alluvial soils, bearing willow, poplar, and alder, are cheaply and readily cleared

by fire. In the agricultural districts described, there is, however, enough for farming purposes on a small scale, into which the farmer can at once put his plough; the clearing of the timber from the land keeping pace with the wants of a farm, for out-buildings, and other purposes.

Farming operations are conducted on the same rotation four-course system as in England. The crops generally raised are wheat, barley, oats, and peas. The green crops are, turnips, mangel-wurzel, vetches, potatoes, and all kinds of vegetables. Nowhere does the potatoe flourish more or attain a better flavour.

In its soils, Vancouver island possesses all the qualifications necessary for raising food for man and beast; and these soils are by no means so limited in extent or inferior in quality, as to preclude the possibility of the island being a grain producing colony. The mineral resources of Vancouver may be summed up as coal, copper, and possibly silver and gold. The latter is widely spread over the country in the drift clays and gravels; and of late, auriferous quartz has been found in the neighbourhood of Victoria.

The following will give some idea of the resources of Vancouver island in woods of economic value. The list is according to popular names. White fir, spruce fir, balsam fir, white pine, yellow pine, cedar, vine-leaved maple, broad-leaved maple, alder, willow, poplar, yew, logwood, cotton-wood, crab-apple, service-tree, hemlock, oak, arbutus, yellow cypress, &c. Of all these, the white fir or Douglas pine (*Abies Douglasii*) is the most important; it grows to an enormous size, and is one of the best woods for spars known. This is the tree of the colony, and it is the commonest on the north-west coast. The cedars are very fine; they are found in great abundance both at Sooke and Nanaimo.

The fisheries will one day prove a source of great wealth to the colony. Extensive banks lie off the south-western extremity of the island, and also in Puget sound and in the gulf or strait of Georgia, off Burrard inlet. All of them are well stocked with fish, especially cod, the true *gadus*, an excellent fish of its family, small but very good. In the neighbouring streams and lakes, and surrounding seas, are salmon (five species), trout (many species), herring, haddock, smelt, halibut, sturgeon, whiting, several species of rock fish, and sea perch, eulachon, &c.

Seeing the island from seaward.—When approaching Vancouver island directly from seaward, the mountains will necessarily be the first part of it that will come into view in clear weather, when they will appear as an unbroken range; on a nearer approach it appears thickly wooded, and apparently fertile, intersected with many deep openings and valleys, which in most cases are some of the inlets already alluded to. The coast is generally low and rocky, but rises immediately to mountains of considerable height. It is fringed by numerous rocks and hidden dangers, especially near the entrances of the sounds, and to avoid these the exercise of great caution and vigilance is requisite; therefore, on no account (except necessity) should a stranger attempt to enter any of the harbours or anchorages during night or thick weather. When about to make the coast, it cannot be too strongly impressed on the mariner to take every opportunity of ascertaining his vessel's position by astronomical observations,

as fogs and thick weather come on very suddenly at all times of the year, more especially during the summer and autumn months.

Tidal Current.—The flood stream appears to set along the coast north-westward, and the ebb south-eastward; neither are of great strength, except in the vicinity of Juan de Fuca strait and Scott islands. During the summer months a set is generally found to the southward, and in winter in the opposite direction, but as a rule the currents are irregular, and apparently influenced by prevailing winds.

Soundings.—At the entrance of Juan de Fuca strait the 100-fathom edge of the bank extends upwards of 80 miles from the shore; it then runs nearly straight in a N.W. by W. direction, gradually nearing the coast, until abreast cape Cook the depth of 100 fathoms is within 4 miles of the shore; north-westward of cape Cook the 100-fathom edge does not extend more than 10 miles off shore, and southward and westward of Scott islands even less.

The nature of the bottom, when under 100 fathoms, appears to be generally of sand and gravel, and does not differ enough in one part from another to afford any guide for ascertaining a vessel's exact position on the coast; the bank, however, extends sufficiently far from the shore south-eastward of cape Cook to give a seaman due notice in thick weather of an approach to the land, as the edge of 100 fathoms does not come within 18 miles of it, and the bank shoals very gradually.

The Coast.—The south coast of Vancouver island having been fully described in the section on Juan de Fuca strait, it remains for us to add a few remarks upon the harbours on the south-west side of the island. For a complete description of these harbours and the coast, also for the channels separating the island from the main land, we must refer our readers to the *Vancouver Island Pilot* and the charts published by the Admiralty.*

From Bonilla point to cape Beale, the eastern point of entrance to Barclay sound, the coast trends almost due West 28 miles. At about 6 miles from the point is the entrance to Nitinat lake, a narrow and shallow channel having a depth of less than 12 feet in it, and across which the sea usually breaks with great violence in bad weather. The lake is of considerable size, extending to the northward. The hills immediately northward of it are estimated to be 2000 feet high. At 2 miles southward from the lake the depth is 27 fathoms.

A remarkable waterfall named, Tausiat, situated on the coast—in lat. $48^{\circ} 41\frac{1}{4}'$, long. $124^{\circ} 58'$, is an important landmark to vessels approaching Juan de Fuca strait from southward. It can be recognised from a considerable distance.

In long. $125^{\circ} 8'$ is a bay named Pachena, having in front of it a small islet, only 10 feet high, known as Sea-bird islet. The bay extends 2 miles in a northerly direction, is nearly three-quarters of a mile wide, and has a depth of 6 fathoms at the entrance shoaling gradually to 8 feet at its head. It is safe only with winds from the land, for southerly and south-west winds send in a heavy swell, consequently vessels very seldom enter it. At its head is a stream which will admit boats.

Cape Beale Light.—A light revolving every 80 seconds is exhibited from a square

* See the Note at foot of page 315.

tower on cape Beale, the south-east point of the entrance to Barclay sound; it is 164 feet above the sea and visible 19 miles. Position lat. $48^{\circ} 47' 30''$, long. $125^{\circ} 12' 50''$.

Note.—This light should not be brought to bear to the eastward of E. $\frac{1}{2}$ N.; as foul ground extends off the entrances to Barclay sound, and mariners are cautioned not to attempt to enter Barclay sound at night without local knowledge or a pilot.

BARCLAY SOUND.—In this extensive inlet are many places where a vessel may lie at anchor and be completely protected from the prevailing wind. Scattered about it are islets of various sizes, which are separated generally by passages of depth sufficient for ordinary vessels. The sound is 14 miles wide at the entrance and maintains this breadth for nearly 12 miles inland, when it separates into several narrow inlets or canals, the most extensive and deepest of which, the Alberni canal, extends 23 miles in a northerly direction, its head reaching within 14 miles of the eastern or inner coast of Vancouver island. The depth in front of the settlement at the head of this inlet is 6 to 4 fathoms. The mountains immediately on each side of the inlet are very lofty, some of their summits reaching an altitude of 8000 feet.

The navigation of Barclay sound is too intricate to be attempted by strangers, unless in the exercise of very great caution. It is recommended to have the Admiralty charts Nos. 584 and 592 at hand for reference. It should be observed that generally speaking the shores are low, except in the northern part and among the canals where they become high, rugged and mountainous.

Reefs.—The reefs in the entrance to Barclay sound, those most to seaward, and which may consequently be encountered by vessels sailing along the coast and not intending to enter the sound, are named Danger, Channel, Western, Black rock, Starlight, and Humphries. In addition to these a reef extends out from cape Beale, the east point of entrance, about three-quarters of a mile in a south-easterly direction.

Danger Reef.—This isolated reef is in the south-east part of the entrance to Middle channel, the wide channel leading into Barclay sound between Deer islands on the east and Village island on the west. It is $8\frac{1}{2}$ miles from cape Beale in a W. $\frac{1}{2}$ N. direction, and from it Ship islet (95 feet high), the southernmost of the Deer islands, bears N.E. by E. $\frac{1}{2}$ E. distant $2\frac{1}{2}$ miles. Its extent is but small, and the sea breaks upon it in heavy weather. The position of this reef makes it a very dangerous one; the sea around it is also very deep, there being soundings of 20 to 40 fathoms almost close to it. The marks that have been given for clearing it at the distance of about half a mile, are; on the east side, Swiss Boy island just open west of Entrance island, bearing N.N.E.; on the west side, Mark islet open northward of Ragged island, bearing N.E. (mount Blenheim, 2408 feet high, is on the same line of bearing); and on the south side, Sail rock (100 feet high), in sight westward of Storm island, N.W. by W. $\frac{1}{2}$ W.,—this mark also leads south of Channel reef, the reef mentioned next.

Channel Reef.—This reef lies nearly in the centre of the entrance to Middle channel, its position being $8\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Ship islet, and $1\frac{1}{2}$ miles W.N.W. from Danger reef. It is about a cable in extent, uncovers at low water, and close to its eastern side is a depth of 27 fathoms. In the channel between it and Danger rock is a depth of 19 to 50 fathoms. The mark given for clearing Danger rock on the west side clears this reef on the east side.

Western Reef.—This reef lies in the south-west part of the entrance to Middle channel, its position being $5\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Ship islet, and one mile south of the islands composing Broken group. It is about a cable in extent, awash at low water, and should not be approached within half a mile.

Black Rock.—This rock is at the south-west side of the entrance to Western channel, the wide channel into Barclay sound westward of the cluster of islands known as Broken group. It is 10 feet above high water, of but small extent, and some sunken rocks extend from it 2 cables in an easterly direction. From it Sail rock bears N.E. by E. $\frac{1}{2}$ E., distant $8\frac{1}{2}$ miles.

Starlight Reef.—This is a cluster of rocks above and under water about half a mile westward of Black rock, its centre being in lat. $48^{\circ} 53'$, long. $125^{\circ} 30\frac{1}{2}'$. It is about three-quarters of a mile in extent, and upon it the sea breaks heavily in bad weather.

Humphries Reef.—This is a cluster of rocks 2 cables in extent, situated about one third of a mile southward of Lookout island, an island 150 feet high, on the west side of the entrance to Ugly channel, the westernmost of the channels into Barclay sound.

In a southerly and westerly direction from Barclay sound is a bank of sand and gravel which extends 20 to 25 miles from the land and has upon it soundings of 88 to 48 fathoms. In the middle of this bank is a deep hole, the east part of which is 5 miles south-westward from the entrance; thence the whole extends 19 miles in a W.S.W. direction, with depths varying from 60 to 100 fathoms. This bank and hole are a valuable means of ascertaining a vessel's position when approaching the sound from south-westward in thick weather, as by attention to soundings her position can be ascertained within a few miles. South-eastward of the entrance to the sound the water is deeper, there being at a distance of 10 miles from the shore a depth of 60 to 70 fathoms, on sand and mud.

It is high water in Barclay sound on the days of full and change at 12h. The rise and fall of the tide is about 12 feet.

The Coast.—From Barclay sound the coast trends W. by N. $\frac{1}{2}$ N., about $17\frac{1}{2}$ miles to point Cox, the east point of entrance to Clayoquot sound. The land in the vicinity of the sea may be considered as rather low, and when viewed from a distance, bears the appearance of being well wooded; the coast consists alternately of rocky cliffs and sandy beaches, and has many detached rocks lying at a little distance from it. The surface of this low country is very uneven, and at a short distance from the sea meets a compact body of rugged dreary mountains, whose summits are covered with snow during the greater part of the year, which, says Vancouver, extended on many, though not on all of them, a considerable way down, and impressed us with no great opinion of the fertility of the country.

The depth at about 4 miles off this shore is 20 to 27 fathoms, and it is recommended when coasting along to give it a berth of not less than $2\frac{1}{2}$ miles.

Point Cox is a rocky projection which may be easily recognised by a hill, named Vargas cone, 488 feet high; this rises just within it, and is a conspicuous object when viewed from the westward. The point ought not to be approached nearer than half a mile. Vargas cone is in lat. $49^{\circ} 5' 30''$, long. $125^{\circ} 52' 30''$.

When approaching Clayoquot sound from south-eastward, care is required to avoid

the Gowlland reef, consisting chiefly of a cluster of bare rocks, from 10 to 15 feet above the surface at high tide, situated 2 miles from Vargas cone in a S.E. $\frac{1}{4}$ S. direction. It is three-quarters of a mile from the coast, and should have a berth of at least a mile when passing. Between it and the land are rocks above and under water.

CLAYOQUOT SOUND is comprised between point Cox, just mentioned, and Sharp point, a low rocky projection forming the west side of entrance of Syaney islet, the most western part of the sound. Sharp point forms with the main land on its western side a narrow inlet, named Refuge cove (subsequently described); its extremity is in lat. $49^{\circ} 20' 20''$, long. $126^{\circ} 15' 50''$. From Cox point to Sharp point the direct bearing and distance are W. by N. $\frac{1}{4}$ N., 21 miles.

Clayoquot sound is 30 miles long in a westerly direction, and 16 miles broad. It contains many large islands, one of which, named Flores, is of square form and 7 miles across. Its shores are broken into several inlets of considerable size and depth, the most eastern of which is known as Tofino inlet. Fronting the sound are many dangerous rocks which require due caution to avoid; at a mile outside these the depths vary from 20 to 30 fathoms.

The mountains in and about Clayoquot sound are very lofty, and visible many miles at sea; among them, the Cat-face mountains are conspicuous. The latter consist of a remarkable flat-top range, which rises on the main shore of Vancouver and fronts Ship channel, the only passage into the sound that ought to be attempted by strangers; on its south side are some patches of cliff and bare rock. The highest of the Cat-face mountains has an altitude of 8870 feet, and is in lat. $49^{\circ} 16' 20''$, long. $125^{\circ} 59'$. Mount Colnett, in Meares island, is 2616 feet high; and the most lofty mountain in Flores island has a height of 8000 feet.

As the navigation of Clayoquot sound is too intricate to be followed by strangers, it is useless to give a detailed description of its islands and channels; we therefore refer our readers for a fuller account of it to the *Vancouver Island Pilot* and the Admiralty chart No. 584, without consulting which no shipmaster should attempt to enter. There are several apparently deep channels into the sound, but they are all, with the exception of Ship channel, tortuous and filled with rocks; Ship channel is consequently the only safe passage in. The latter channel may be easily recognised in clear weather by its position with regard to the Cat-face mountains,* but if in doubt, there is generally, when in its vicinity, little difficulty in obtaining the services of a native of sufficient intelligence to pilot a vessel in. The inner waters of the sound should only be navigated by a steamer or a handy vessel of light draught of water, and the chart is the best guide. The following remarks on Ship channel are extracted from the *Vancouver Island Pilot* just alluded to.

"Ship Channel lies westward of Vargas island, between it and a number of small islands and rocks. Its entrance is nearly 11 miles westward of Cox point, and the channel is 5 miles long in a N.N.E. direction, with a breadth varying from three-quarters to $1\frac{1}{4}$ miles. The soundings in the south part vary from 20 to 22 fathoms,

* It lies S.S.W. $\frac{1}{4}$ W. from the north summit of the Cat-face range.

decreasing to $5\frac{1}{2}$ fathoms in the shoalest part near the north end; the tide runs through it from one to 2 knots.

Bare Islet, at the south-east entrance point of the channel, is small, rising to a summit 40 feet high in the centre; it forms a good mark for identifying Ship channel; a rock which breaks lies 5 cables E. by S. from it, but there are 20 fathoms within half a mile of its south-west side.

Plover Reefs, on the east side of the channel half a mile north-westward of Bare island, are of considerable extent, stretching one mile from the west side of Blunden island, and some parts are 6 feet above high water; there are 5 fathoms at 2 cables west of them.

Hobbs and Burgess Islets lie at the north-east part of the channel, 2 cables from the west side of Vargas island, and nearly connected with it at low water; they are small, and may be approached to 2 cables, where are 7 to 8 fathoms water.

Sea Otter rock lies at the south-west entrance point of Ship channel, 2 miles W. by N. from Bare islet; it is very small, only 6 feet above high water, and there are 5 fathoms close-to off its east side.

Shark Reefs, some of which cover, while others are 6 and 10 feet above high water, lie on the west side, 2 miles N.E. by N. of Sea Otter rock; they are about 8 cables in extent, and should not be approached nearer than 2 cables on their south and east sides; between them and Sea Otter rock there are 14 to 24 fathoms.

Lawrence Islets, on the west side, nearly 8 miles from Sea Otter rock, are small, low, and wooded, but steep-to on the east side.

Bartlett Island, half a mile westward of the Lawrence islets, is low and wooded; its shores are much broken, and a number of rocks extend a quarter to half a mile on all sides of it, and the island ought not to be approached within the latter distance.

Twin Islands, at the north-west point of Ship channel, 4 miles from Sea Otter rock, are low, but wooded, and connected at low water; kelp extends one cable south of them.

Entering Clayoquot sound by Ship channel (which latter will easily be recognised by Bare islet, Sea Otter rock, and a remarkable summit inland, the Lone cone*), round either Bare islet or Sea Otter rock at the distance of half a mile, and steer up the channel with the Twin islands in line with the north summit of the Cat-face mountains bearing N.N.E. $\frac{1}{4}$ E.* Keep the above mentioned mark on till within half a mile of the Shark reefs, when haul more to the eastward for the west extreme of Vargas island, which may be rounded at a distance of 8 cables. If going on through Hecate passage into Hecate bay, to clear Half-tide rock keep Hobb islet open west of Burgess islet S. by W. $\frac{1}{4}$ W., until the Twins come in line with the west Whaler island W. by S., when steer up the passage with that mark on astern, which will lead north of Half-tide rock and south of the North bank. When past the latter, steer through Deep pass, and anchor in Hecate bay midway between its entrance points, in 9 or 10 fathoms.

* See view D on Admiralty chart No. 584.

During heavy south-westerly gales the sea is said to break right across Ship channel, between Lawrence and Hobbs islands."

Refuge Cove is a very narrow inlet which runs about $1\frac{1}{4}$ miles in a N.N.W. direction. It is a convenient and easily accessible place of shelter to a vessel embayed near this part of the coast. There is good anchorage within it in 4 to 5 fathoms, and protection is afforded from all winds, although those from the S.S.E. blow directly in. The entrance is narrow but clear of danger, with the exception of a rock 7 feet under water at nearly 2 cables N.N.W. from the extremity of Sharp point; to clear this, keep over to the western side as you sail in, after passing within the point of entrance.*

When approaching Refuge cove from westward and south-westward it will be necessary to look out for the Canoe reef, a ledge of rocks just south-westward of the entrance and three-quarters of a mile westward of the extremity of Sharp point. It is 4 cables from the shore, and 2 feet above the sea at high tide; being steep-to on its south and west sides it must be approached with great care. Between it and the land is no safe passage.

"Entering Refuge cove from seaward, bring the entrance or Sharp point to bear N.N.W. $\frac{1}{4}$ W. and steer for it, so as to pass one cable west of the point; then keep close to the eastern shore and anchor in $4\frac{1}{2}$ or 5 fathoms, about 7 or 8 cables within the entrance." *Vancouver Island Pilot*.

Hesquiat Harbour.—From Refuge cove the coast trends 7 miles in a W. by N. direction to Hesquiat bluff on the eastern side of Hesquiat harbour;—which will be easily recognised as it is a low wooded point with a shingle beach around it. The eastern shore of Estevan point, subsequently mentioned, forms the western side of the bay. The bay extends into the land about 4 miles N.N.W., and is at first upwards of 2 miles wide, it then increases a little in breadth but as its head is approached it contracts in width to less than a mile. The soundings within are 5 to 9 fathoms, and across the entrance is a bar, 8 cables wide, upon which is a depth of 8 fathoms. Depths of less than 5 fathoms throughout the bay are generally indicated by the presence of kelp. The shores of the harbour are low and wooded.

When entering give the shores a berth of more than half a mile, till within the bar, when they may be approached to the distance of 2 cables. Hesquiat bluff, especially, requires a wide offing, because a reef, dry only at low tide, extends from it half a mile in a south-westerly direction; this reef has a depth of 5 fathoms close to its extremity. Having passed within the bar, anchorage may be obtained in any convenient part, but the best place is near the centre of the harbour, at about half a mile from Boat basin at its head; here the depth is 8 to 7 fathoms, on sand.

Boat basin is a little creek having a depth of 4 fathoms. A stream falls into it from which good water may be procured if necessary.

Hesquiat harbour is of access to sailing vessels even with a foul wind. Although during strong south or south-westerly winds the sea breaks heavily upon the bar, the sea within is comparatively smooth; hence the anchorage is always safe. A landing is at all times practicable in Boat basin.

* See the plan of the cove in the chart No. 584.

The mountains on the east and north sides of the harbour are very lofty. That named Leading mountain at the head of the harbour is 2726 feet high; if this peak is brought to bear N. by W. $\frac{1}{2}$ W., it will lead across the bar clear of all sunken dangers on either side, but directly over a small spot of 8 fathoms.

Estevan Point, on the western side of Hesquiat harbour, terminates in a low wooded projection, bordered by a sandy beach strewn with boulders. Its south-west point, Hole in the Wall, is in lat. $49^{\circ} 22' 7''$, long. $126^{\circ} 32' 32''$; it is so named on account of a remarkable gap in the trees at its extremity, which is conspicuous when viewed from the south-westward. At $1\frac{1}{2}$ miles due South from this gap the depth is 20 to 27 fathoms, sand, stones, and gravel, on an uneven bottom.

From the western side of Estevan point a line of rocks extends out upwards of a mile, and outside this at a short distance is a sunken rock, named Sunday rock; hence this side of the point must have a wide berth, indeed, it will not be prudent to approach it nearer than 2 miles. From the extremity of Estevan point to the entrance of Nootka sound the distance is 18 miles.

NOOTKA SOUND.—This extensive inlet contains some of the best sheltered and most commodious anchorages on the west coast of Vancouver island; it has, however, lost the importance that once attached to it. The inlet proper is a sheet of water of about 6 miles in extent, containing several islands, and from its north and north-east sides deep narrow canals with precipitous shores extend into the land 7 to 18 miles. The depth over the sound is generally about 80 fathoms, but there are parts where there is much more water. In consequence of this great depth the middle of the sound is not suitable for anchorage, and vessels are obliged to seek the little bays and inlets formed by the shores and islets. The anchorages usually resorted to are Friendly cove (just within the entrance of the sound, on its western side); Marvins bay (on the same side of the sound at about 4 miles from Friendly cove); Plumper harbour (2 miles from Marvins bay, and at the entrance to Kendrick arm); Resolution cove (just within the sound, at the south-east end of Bligh island); Deserted creek (in Tlupana arm); and Head bay (at the northern termination of Tlupana arm);—it is however seldom that vessels enter the sound so far as to attain either Kendrick arm or Tlupana arm.

The entrance to Nootka sound lies between Escalante and Maquinna points, distant from each other 4 miles in a W. by N. $\frac{1}{2}$ N., and E. by S. $\frac{1}{2}$ S. direction. Escalante, the eastern point, is low and rocky, and has some small islets and rocks off it to the distance of upwards of a mile. Maquinna point is also low and wooded, and has at its extremity a remarkable bare-topped conical rock 60 or 70 feet high;—some rocks extend 8 cables from it in an easterly direction, and as there are also rocks along the coast from it eastward nearly as far as the entrance of Friendly cove, the shore ought not to be approached nearer than three quarters of a mile till near the latter place.

The narrowest part of the entrance to the sound is at Friendly cove, where the distance to Burdwood point on the opposite shore is only 2 miles. From this point to Escalante point the shore is bordered by rocks, and when entering the sound should have a berth of at least a mile until close to Burdwood point, which (as it is steep and clear of rocks with the exception of those at its base) may be rounded at the distance of $1\frac{1}{2}$ cables.

Bajo Point and Reef.—From Maquinna point the coast trends almost due West $6\frac{1}{2}$ miles to Bajo point, a low rocky projection forming the extreme south-west point of Nootka island; this point is outside the entrance to the sound, and is mentioned here because it (with its surrounding reef) is a prominent danger to vessels approaching the sound from westward. A ledge, named the Inner Bajo reef, lies $1\frac{1}{4}$ miles from the point in a southerly direction; the outer edge of this reef has a depth of 12 fathoms close to it, and it is believed that there is no safe passage between it and the shore. In addition to the rocks surrounding Bajo point, there is a very dangerous reef at about 8 miles S.S.E. from the point, upon which the sea breaks in heavy weather; it is named Bajo reef, is about 2 cables in extent, and from it Maquinna point bears N.E. by E. $\frac{1}{4}$ E., distant 6 miles.

Bajo reef has deep water of 8 to 10 fathoms at a very moderate distance from it, and as the sea does not always break over it the greatest care is required when in its vicinity. The mark to clear it at the distance of $1\frac{1}{4}$ miles on its south-east side is Yuquot point, the east extreme of Nootka island, kept open eastward of Maquinna point, N.E. $\frac{1}{4}$ E.; and at $1\frac{1}{4}$ miles on its west side, Bight cone (a remarkable summit on the south side of Nootka island) kept well open west of Bajo point, N. by W.

Friendly Cove is about 2 cables in extent and sheltered from the sea by a small rocky high-water island on its east side. The entrance to it is from the north-eastward, and only a cable wide. The anchorage within is in 9 to 5 fathoms, and of such limited extent that there is only room for one vessel of moderate size to lie moored in the middle, though several very small ones would find shelter. The shores on both sides of the cove are rocky and about 60 feet high on the north side; at its head is a small space of clear cultivated flat land, around which during summer the natives build an extensive village.

If intending to anchor in this cove, round Observatory islet*, the east entrance point, close-to. A large vessel should moor with anchors S.S.W. and N.N.E., letting go the first immediately on entering the cove. Sailing vessels, unless with a fair wind, would find some difficulty in entering; if unable to shoot in, it would be preferable to warp or proceed farther up the sound to Plumper harbour.

This place was visited in 1887 by Sir E. Belcher, R.N., who says, "We anchored in Friendly cove, Nootka sound, the very interesting point of Cook and Vancouver's operations. At first I doubted my senses, that so small a space could have occupied so much type, and until I had examined it myself in my boat, did not think that it could afford shelter to two vessels. However, by placing one anchor outside, one well in, and the stream cable to the rocks, the *Sulphur* became well secure, with the *Starling* within us. The greatest distance between any two points does not exceed a quarter of a mile, and mostly rocky."

Marvinas Bay.—From Friendly cove the distance to Marvinas bay is 4 miles in a N.N.W. direction. The coast between is rocky, and in its south part has some islets at a short distance off and parallel to it. There are two small creeks with entrances

* The geographical position of this rock is lat. $49^{\circ} 35' 31''$, long. $126^{\circ} 37' 33''$. For Nootka sound, see the Admiralty charts Nos. 569 and 1916.

too narrow for a vessel to enter; the northernmost of them, the Boca del Inferno, lies abreast the north part of the above-mentioned islands, and 1½ miles from Friendly cove.

Marvinas bay is open to southward, and only large enough to admit a coaster; there is a large fresh-water stream at the head and just south of it, convenient for watering. In former times this bay was in considerable repute, for although farther from the sea than Friendly cove, it possesses over it several advantages in point of security and accommodation. The land in its vicinity continues to be low to a greater distance than about Friendly cove, and is apparently composed of less rocky materials. The harbour being well protected against all winds, and its distance from the ocean preventing it being much affected by the swell, a vessel can ride in it in perfect security; and as there is a fair navigable channel from it in a southerly direction, a vessel can leave whenever the land-wind prevails sufficiently to enable it to clear the sound, with infinitely more ease than from Friendly cove; out of which it is frequently necessary to first warp a considerable distance, and where there is anchorage not only in an inconvenient depth of water, but on an uneven rocky bottom, in addition to which, in the event of the wind suddenly setting strongly in from the sea, the situation becomes by no means pleasant. The departure from Friendly cove, although not difficult in summer, is said to be subject in winter to great inconvenience, and indeed danger, from the heavy sea that rolls in stormy weather into the sound, especially during the S.E. gales, against which, from its vicinity to the ocean, it is not sufficiently protected.

Pumper Harbour, a small bay on the east side of Nootka island, is about 8 cables in extent and affords good anchorage in 12 fathoms. It is protected on the *east* side by two small wooded islets from 80 to 40 feet high; on the *west* side the shore is rather swampy, and there are several fresh-water streams.

The passage between the two islets is clear; vessels may also pass northward of the northern one, passing it at a cable's length, and being careful to avoid a 10-foot reef which extends from the shore. When inside, there is room for a vessel to ride at single anchor. This is the best anchorage in the sound, its only drawback being its distance from the sea.

Resolution Cove is only a slight bend in the coast, and is a very inconvenient anchorage for large vessels, being exposed to south-westward. The bottom is deep and rocky. It is named after one of Captain Cook's vessels which was refitted here in 1778.

Deserted Creek is 2 miles long in a westerly direction, and at its entrance, on the north shore, is a cove, named Island bay (from the circumstance that there is an islet in its centre). The best anchorage in the creek is in 12 to 14 fathoms, at about one-third of a mile from the stream which falls into its head; vessels may also anchor in Island cove, in 12 fathoms, on the west side of the islet. At both places there is good shelter from all winds.

Head Bay is nearly a mile long in a westerly direction and 4 cables wide. At its entrance on the northern side are three small islets just above the surface at high tide, the inner one of which is connected to the shore by a sandy flat dry at low water.

The anchorage is in 14 to 16 fathoms at about one-third of a mile from the head of the bay, and is well protected from all winds.

In the bay eastward of Head bay, formed by Perpendicular head and the coast northward of it, vessels may anchor in 16 to 18 fathoms. Perpendicular head is very lofty, its summit being 2600 feet high.

Directions.—The land surrounding Nootka sound presents to the seaman in fine weather many striking features, which render it almost impossible for him to mistake the sound for any of the numerous inlets on the west coast of Vancouver island. Estevan and Maquinna points are both low and have breakers off them; the peculiar shaped hill, Nootka cone, 1619 feet high, situated almost immediately behind Friendly cove, is a remarkable object, and when N.N.E. (the bearing upon which it would be seen when making the sound from seaward) is very conspicuous. Mount Lombard, behind Burdwood point, is 3000 feet high; and E.N.E. from this is mount Albermarle, 3756 feet high. Conuma peak, in the interior behind the sound, in lat. $49^{\circ} 49\frac{1}{2}'$, long. $126^{\circ} 18'$, has an altitude of 4889 feet and can be seen from a considerable distance; its summit is steeple-shaped.

The soundings at the entrance to the sound vary from 60 to 40 fathoms. Southward of the entrance, and extending 6 miles westward of Estevan and Escalante points, is a bank of 22 to 30 fathoms, deepening gradually in a south-westerly direction. In the vicinity of Bajo reef, and westward of it, are from 20 to 27 fathoms; but at the distance of 7 miles southward from Nootka island is a depth of 40 to 60 fathoms. In fine weather, the natives will be met with in canoes in considerable numbers on these banks fishing for halibut, which are very plentiful along this coast.

Approaching the sound from southward, after rounding Estevan point steer about N.N.W. for the entrance, which will be easily distinguished by the rocks off Escalante and Maquinna point; keep about 2 miles from the eastern shore till past Escalante point, and then steer up in mid-channel into the sound.

If bound to Friendly cove haul over to the west side of entrance for Yuquot point, which may be approached to the distance of a cable; round the islets sharply, and anchor or moor in the cove, as most convenient, in 9 to 5 fathoms.

If bound to Plumper harbour, after passing Yuquot point keep about half a mile from the north-east side of Nootka island, on a N.N.W. or N. by W. course for a distance of 5 miles to the entrance of Kendrick arm; steer up the latter in mid-channel till abreast Plumper harbour, which may be entered by passing between Bold and Pass islets (the islets fronting it on its east side) or by going northward of the former. Anchor in 11 to 12 fathoms near the centre of the harbour.

Should it be desired to anchor in any of the anchorages within Tlapana arm, steer as before directed till within half a mile of the entrance to Kendrick arm; haul then to the north-eastward, pass westward of Junction and Bligh islands, and steer up Tlapana arm in mid-channel, or close-to on either shore. Deserted creek and Head bay are clear of danger and may be entered without difficulty; if provided with the chart no directions whatever are necessary.

Entering Nootka sound from westward, on nearing Bajo point do not approach the south shore of Nootka island within 4 miles, nor shut in Bight cone with Bajo point

N. by W. until Yuquot point comes open eastward of Maquinna point N.E. $\frac{1}{2}$ E., which will clear the Bajo reef; a vessel may then steer for the entrance of the sound, about N.E. by E., not approaching the shore between Maquinna and Yuquot points nearer than a mile, until breast the latter, which may be rounded close-to; proceed then up the sound as before directed.

If beating into Nootka sound, when standing to the westward, keep Yuquot point open eastward of Maquinna point N.E. $\frac{1}{2}$ E., as this will keep a vessel well clear eastward of Bajo reef. In standing to the eastward do not approach Escalante point within $1\frac{1}{2}$ miles, nor bring Burdwood point northward of N. by E. until abreast it, when the shore may be approached close-to. When standing towards Maquinna and Yuquot points on the west side, avoid bringing the latter to bear eastward of N.N.E. until abreast it, when it may be approached close-to.

Nootka sound is the easiest place of access on the whole of the west coast of Vancouver island, the entrance being nearly 2 miles wide in the narrowest part; and by attending to the above directions any sailing vessel may beat in or out of the sound. Provided with a chart, if the night be clear, it may be entered without risk by bringing the entrance to bear N.N.E., and in a steamer but little difficulty would be experienced in picking up the anchorages of Friendly cove and Plumper harbour.

NUCHATLITZ INLET.—Point Ferrer, the west point of Nootka island, is a low and rocky projection, which may be readily recognised when viewed from westward by a remarkable hill 850 feet high immediately eastward of it; this hill has a conical summit, is known as the North-west cone, and is situated in lat. $49^{\circ} 44' 50''$, long. $126^{\circ} 58' 50''$. The depth at about 2 cables south-westward from the extremity of the point is 14 fathoms.

Nuchatlitz inlet runs into the shore of Nootka island north of Ferrer point, about 10 miles in a N.E. $\frac{1}{2}$ E. direction. It is 8 miles wide at the entrance and gradually narrows towards its head. Its shores are high and rocky, and much broken into creeks and small bays, in some of which there is doubtless shelter for small vessels. The depth is 17 to 5 fathoms, the latter being in Mary basin at $6\frac{1}{2}$ miles from point Ferrer; in Inner basin, eastward of Mary basin, the depth is 40 to 18 fathoms.

The only place that can be recommended as an anchorage in the inlet is a small bay on its north side, named port Langford. The depth here is 8 to 5 fathoms. Vessels anchor at about half a mile from its head in 6 fathoms, mud, and are well protected from almost all winds.

In the entrance to the inlet are several rocks and detached reefs; hence strangers should not attempt to enter without a pilot. There is generally a heavy sea over and about these reefs.*

ESPERANZA INLET.—This inlet lies between the north-west side of Nootka island and the main of Vancouver; it is about 16 miles long in a winding north-easterly direction, and its average breadth is about one mile, narrowing at the head, which is connected by a narrow pass, Tah-sis narrows, to the Tah-sis canal in Nootka sound.

* See the Admiralty charts Nos. 569 and 569 for Nuchatlitz and Esperanza inlets.

The shores are nearly everywhere steep-to, rising on both sides to mountains of considerable height. The southern shore is indented by three bays of moderate extent, which however afford no anchorage; and from the northern one three arms of considerable length penetrate the Vancouver shore for several miles in a N.N.W. direction. In the western arm, named port Eliza, is the only anchorage within the inlet.

The soundings in the entrance vary from 12 to 20 fathoms, deepening within to upwards of 100 fathoms in many parts. Scattered about the entrance to this and Nuchatlitz inlet are the following dangers, Danger rock, Nuchatlitz reef, South reef, Blind reef, Needle rock, Middle reef, Low rock, Black rock, besides others between Catala island and Tat-chu point, the western limit of Esperanza inlet.

Danger Rock, situated upwards of a mile N.W. $\frac{1}{2}$ W. from Ferrer point, is the worst danger in the entrance to Nuchatlitz inlet, as it is of very small extent, and only breaks in heavy weather. It is steep-to on all sides, there being 11 fathoms close to it. Mark hill, at the head of the inlet, on with the north part of Fitz island bearing N.E. $\frac{1}{2}$ E. leads south of this rock, also midway between it and Ferrer point, and through the fairway into the inlet.

Nuchatlitz Reef, in the centre of the entrance to Nuchatlitz inlet and a third of a mile north of Danger rock, is about three-quarters of a mile long in an E.N.E. and W.S.W. direction, and a cable wide. This reef generally breaks, and at its inner extremity is a small rock awash at high water. There is a clear deep passage between it and Danger rock, and also one apparently northward of it, but neither should be attempted by a stranger, as no leading marks can be given for going through them.

South Reef.—This reef lies just within the entrance to Nuchatlitz inlet on the south side, at one mile N.E. by N. from Ferrer point and about 8 cables off shore; it is nearly 2 cables in extent, and covers at half flood. Mark hill, on with the north summit of Fitz island, bearing N.E. $\frac{1}{2}$ E. leads 2 cables north of it.

Blind Reef lies at the south-east extreme of Middle channel, the principal entrance to Esperanza inlet. It is 8 miles N.W. $\frac{1}{2}$ W. from Ferrer point, is about 2 cables in extent, and only breaks in bad weather. At a cable northward of it is a small rock, and at the distance of 2 cables from its south and west sides is a depth of 18 to 19 fathoms.

Needle Rock.—This small rock lies two-thirds of a mile North of the Middle reef; at the distance of 2 cables westward from it is a depth of 14 to 16 fathoms.

Middle Reef lies at the south-west entrance point of Middle channel and separates it from the North channel; it is about 8 cables long in a northerly direction, and a cable wide. This reef generally breaks, and at its south extremity is a small rock 4 feet above high water; this part of the reef lies 4 miles N.W. by W. $\frac{1}{2}$ W. from Ferrer point. The depth at about a cable from the reef on all sides is 5 to 20 fathoms.

Leading hill in line with Black rock N. by W. leads two-thirds of a mile west of Blind reef, one mile west of Needle rock, half a mile east of Middle reef, and through the fairway of Middle channel.

Low Rock.—This rock is distant nearly a mile due West from Middle reef, and the depth between is about 20 fathoms. It is 6 feet above water at high tide, and is

steep-to. It is the outermost of the dangers off the south-west side of Catala island, and consequently most to seaward. From it the Twins bear N. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles; the space between is all foul ground,—among the rocks is the outer Black rock, 10 feet high.

Black Rock, 20 feet above the surface at high tide, is situated a third of a mile eastward of the east point of Catala island; between is no safe channel, and there is also foul ground at a cable south of it. The eastern side of this rock should not be approached nearer than 2 cables, nor should an attempt be made to go westward of it.

Half-tide and Obstruction Reefs, &c.,—The space between Catala island and Tat-chu point, distant from each other $8\frac{1}{2}$ miles, is occupied by numerous reefs of which Half-tide and Obstruction are farthest from the land; hence it should always have a wide berth. Tat-chu point is in lat. $49^{\circ} 51\frac{1}{4}'$, long. $127^{\circ} 10'$; it is a cliffy projection of coast and has a reef at its base extending nearly half a mile out. At $1\frac{1}{2}$ miles inland from the point is Eliza dome, a remarkable mountain 2819 feet high; which is a very conspicuous object from seaward.

Directions.—The reefs fronting Esperanza inlet form two channels, each having sufficient depth and breadth for the largest vessels; Middle channel is, however, the widest. It is only in the western arm of the inlet, port Eliza, that anchorage can be obtained, and here vessels may lie in perfect security from all winds. The usual and best place to ride in is at about half a mile from its head, in 14 to 15 fathoms; but anchorage may also be obtained in Queen cove, a small inlet on the east side of the port at rather more than a mile from the entrance. The following sailing directions are from the *Vancouver Island Pilot*, and should be used in connection with the Admiralty charts already referred to.

“A stranger entering Esperanza inlet from the southward, through the Middle channel, and intending to anchor in port Eliza, should pass Ferrer point at a distance of about 8 miles, and keep on a northerly course till nearing the entrance of Middle channel, when steer to bring Leading hill in line with Black rock N. by W., which will lead through the fairway, and clear of the dangers on both sides of the channel. When the south point of Catala island bears W.N.W., the vessel will be inside the dangers at entrance, and should keep about N.N.E. for the entrance of port Eliza, passing from 2 to 8 cables east of Double island. In entering the port steer through Birthday channel, passing a cable east of Harbour island; when past the east point of the latter, keep about N.W. by N. for the entrance of Queens cove, or farther over to the eastern shore, to avoid Channel reef; in entering the cove, pass to the west of the island at its entrance, and moor immediately the vessel is inside, anchors N.W. and S.E.

If going to the head of port Eliza, keep on as before directed till within a cable of Queens cove, when haul sharply to the westward, keeping about one cable off the east shore, till Fairway island comes on with the east point of Harbour island S.E. by E., when the vessel will be west of Channel reef, and may steer up the port in mid-channel, anchoring near the centre, about 4 or 5 cables from the head, in 15 or 16 fathoms.

No sailing vessel of any size should attempt to enter port Eliza unless with a steady fair wind.

If bound to Rolling roadstead, enter the Middle channel as before directed, but instead of steering for the entrance of port Eliza, keep on a N. by W. or N. $\frac{1}{2}$ W. course (passing about a quarter of a mile east of Black rock), until the outer extreme of the islets off the north-west part of Catala island comes open north of the low grassy point on its north side bearing W. by S., when haul in for the roadstead on that mark, which will lead midway between Arnold and Entrance reefs; anchor in 6 fathoms, with the extremes of Catala island bearing W.S.W. and S.E. by S.

Entering Esperanza inlet from the westward, keep an offing of $2\frac{1}{2}$ or 3 miles from Catala island (if Kyuquot hill be made out, by keeping it open west of Tat-chu point, N.W. by W., a vessel will be well clear of any dangers off Catala island), till Double island comes in line with Black rock, N. by E. $\frac{1}{2}$ E., and entering the inlet through the North channel with this mark on, which will lead in clear of danger. When the Twins bear W. by N., haul more to the eastward, passing a quarter of a mile outside the Mid and Black rocks, and steer for Rolling roadstead or port Eliza as before directed.

If the weather be clear and the marks can be made out, both North and Middle channels are equally good, the latter being wide enough for a vessel to beat through, though it would be a hazardous thing for a stranger to attempt, as no turning marks can be given.

Generally a heavy swell prevails off the entrance of the Nuchatlitz and Esperanza inlets, and no sailing vessel should attempt to enter, or leave either of them, unless with a steady fair or leading wind.

Soundings from 20 to 40 fathoms will be found extending for nearly 20 miles westward from the entrances of Nuchatlitz and Esperanza inlets; to the S.S.W., at a distance of 10 miles off shore, are from 70 to 80 fathoms."

KYUQUOT SOUND.—From Tat-chu point the coast trends 7 miles in a N.W. by W. direction to Rugged point on the eastern side of the entrance to Kyuquot sound. It is indented by several small bays, in some of which boats may find shelter; and, fronting it are some islets and reefs, so that it should always have a wide berth. The danger farthest to seaward, East Entrance reef, is $2\frac{1}{2}$ miles from the land, and has a depth of about 20 fathoms close to it; it is 4 feet above the surface at high tide.

The sound is a large broken sheet of water extending 14 and 15 miles inland in two large arms, and several smaller ones. The large island at the entrance, named Union, is 1848 feet high; it divides the entrance into two channels, of which the eastern one only is fit for large vessels; there are also several islands of smaller size within. The shores are generally rocky, and very much broken, rising to mountains 2000 and 4000 feet high.

The soundings outside the sound vary from 40 to 20 fathoms, generally on sand; at the entrance the depth is from 40 to 60 fathoms, but within the depths increase in many places to upwards of a 100 fathoms. There are three anchorages, Narrowgut and Easy creeks, and Fair harbour, the two latter being of considerable size but at a distance of 18 and 10 miles from the sea; the former is very small, and only 5 miles within the sound, on its eastern side.

The eastern (Kyuquot) channel leads into the sound eastward of Union island. It

is nearly straight, about 5 miles long in a N.N.E. direction, and its breadth is little less than a mile. The soundings within it vary from 80 to upwards of 40 fathoms, increasing gradually to the inner part. When running through, keep in mid-channel and all danger will be avoided. It is, however, to be remarked that no sailing vessel should attempt the channel unless with a steady fair or leading wind, as generally a heavy swell prevails outside, which in a light wind would render her position critical; and no stranger should attempt to enter unless provided with the Admiralty charts (Nos. 588 and 717), the weather clear, and the leading mark for the channel well made out. This mark is the summit of Leading island midway between Rugged and Chat-channel points, bearing N. by E. $\frac{1}{2}$ E.

BARRIER ISLANDS.—Facing this part of the shore of Vancouver is a multitude of islets and rocks, which extend in some parts as much as 5 miles from the land. They commence at 2 miles westward from Tat-chu point, and continue for nearly 20 miles along the land in a W.N.W. direction, or as far as the inlets on the east side of Brooks peninsula. Through them are two known navigable channels, the Kyuquot (into Kyuquot sound) and Halibut (leading to Clan-ninick harbour), but as a rule no stranger should venture into them, or among the islands, unless the weather be clear, and there is a pilot on board.

Highest island, one of the Barrier group, lying 2 miles south of Union island, is a remarkable bare rock 98 feet high, and useful in identifying the Kyuquot channel. It is in lat. $49^{\circ} 57' 45''$, long. $127^{\circ} 21' 30''$.

Table island, on the east side of Halibut channel, is the largest of the Barrier islands, being nearly half a mile in extent, and about 150 feet high; some rocks, mostly above water, extend half a mile from its south side, the outer one being 50 feet high, with 15 fathoms 2 cables west of it. Trap bluff on the west side of the island is conspicuous.

Half a mile eastward of Table island is an anchorage for small vessels having a depth of 4 to 6 fathoms. It is tolerably sheltered by some islands, and much used by coasters in summer months; the entrance to it being rather intricate, no stranger should attempt to enter.

In thick weather it is imprudent to stand nearer the Barrier islands than the depth of 40 fathoms.

OU-OU-KINSH and NASPARTI INLETS.—These inlets are in the bay eastward of and under the broad and lofty promontory of which cape Cook is the south-west extremity; Naspardi is the westernmost inlet. In neither is there anchorage except with winds from the land, and access to both is too difficult to be attempted by a stranger. Facing the approach to them are many rocks and detached reefs, causing heavy breakers when the wind blows strongly on shore. The outermost of these dangers, Sullivan reef, is a patch of rocks situated in lat. $50^{\circ} 4' 30''$, long. $127^{\circ} 41'$; it is nearly 8 miles outside the entrance of Ou-ou-kinsh inlet, $2\frac{1}{2}$ miles W. by S. from Clara islet, and nearly 4 miles S.S.E. of Hat island in Naspardi inlet. This patch is about half a mile in extent East and West, and steep-to—there being a depth of 10 to 11 fathoms close around it.

The entrance to Ou-ou-kinsh inlet open N.N.E. leads $1\frac{1}{2}$ miles eastward of Sullivan

reef: Solander island off cape Cook just open or shut in by the land east of the cape bearing West, leads $1\frac{1}{2}$ miles southward of it; Hat island, in the entrance of Nasparti inlet, in line with a summit on the west side of the latter, bearing North, leads $1\frac{1}{2}$ miles westward of it; and Hat island seen between the Haystacks N.W. by N., leads three-quarters of a mile north-east of it. The reef is extremely dangerous as it is only occasionally that the sea breaks over it.

BROOKS PENINSULA.—Westward of Nasparti inlet is Brooks peninsula, a lofty promontory of an oblong shape, which projects into the sea in a S.S.W. direction about 9 miles; its breadth is 5 miles. The shores are generally very rocky, and rise almost abruptly to upwards of 2000 feet, while its mountains are from 2500 to 3000 feet high. Off it are several dangers, some of which extend upwards of a mile from shore; of these, Banks reef, at three-quarters of a mile from its south coast, is dry until three-quarters flood.

Cape Cook, the south-west extremity of Brooks peninsula, and the most projecting point of the outer coast of Vancouver island, rises abruptly from the sea to a summit 1200 feet high. At nearly a mile westward from it lies Solander island, which is bare, 580 feet high, and has two sharp summits; between it and the cape the channel is filled with rocks, hence no attempt should be made to go eastward of the island. Solander island is in lat. $50^{\circ} 6' 31''$, long. $127^{\circ} 57' 20''$.

The depth at about 2 miles off cape Cook and at the same distance off the south side of the peninsula, is 20 to 90 fathoms; as a rule no vessel should approach nearer.

BROOKS BAY.—The bay on the north-west side of Brooks peninsula is about 12 miles wide, and 6 miles deep. In it are several rocks above and under water, upon which account it should not be entered. In its two inlets, Klaskish and Klaskino, vessels may anchor but as these anchorages are difficult of access, no shipmaster should attempt either unless embayed and unable to get out of the bay. Brooks bay is quite open to all winds from westward, and when these prevail with any strength a tremendous sea is sent in.

Clerke Reefs.—At about 5 miles northward of cape Cook are two islets, Single and Double, of which the latter is distant from the shore about a mile. Outside these are Clerke reefs, a cluster partly above the surface, extending 2 miles from the land and occupying an extent of fully 2 miles; these reefs are extremely dangerous, and should always have a wide berth,—to clear them at the distance of a mile on the west side, do not approach them nearer than when the extremity of cape Cook bears S.S.E. $\frac{1}{2}$ E.; and at the distance of $1\frac{1}{2}$ miles on the north side, Small islet, on the north side of the entrance to Klaskish inlet, should be brought in one with Leading cone, a hill 500 feet high, situated at the head of the inlet, N.E. by E. $\frac{1}{2}$ E.

Ship Rock.—This is a rock of very limited extent situated about 8 miles N.N.W. from Clerke reefs, and in nearly the centre of Brooks bay; it is consequently 2 miles from shore, and from its position a very dangerous reef to vessels bound into either Klaskino or Klaskish inlets. The depth close to its southern and eastern sides is 17 to 20 fathoms, and upon it the sea generally breaks heavily. To clear it at nearly three-quarters of a mile on its south side, bring small islet in line with Leading cone (already mentioned), N.E. by E. $\frac{1}{2}$ E.; and at nearly 2 miles on its north-west side,

Twenty-foot rock (at the entrance of Klaskino inlet), in line with the lower part of the stripe in Red Stripe mountain (on the north shore of that inlet), N.N.E. $\frac{1}{2}$ E.

QUATSINO SOUND is at about 8 miles north-westward from Klaskino inlet, round a projecting point of land, of which Lawn point (a low shore, having rocks extending from it about half a mile in an easterly direction) is the extremity. Immediately within Lawn point the land is very lofty, being about 1900 feet high; the depth at a short distance outside the rocks is 10 to 20 fathoms.

Quatsino sound is an extensive and very deep inlet, containing in many parts good well-sheltered anchorages. The shores are generally lofty, and near the sea very irregular; Gap mountain, on the east side of entrance rises in two peaks, of the respective heights of 2204 and 2088 feet; the mountain over the west point of entrance is not less than 1275 feet high; and Nose peak on the north side of the entrance is 1780 feet high, and easily recognised by its sharp rocky summit. These lofty mountains render it by no means difficult to distinguish the entrance, especially when viewed directly from southward.

The extent of Quatsino sound is upwards of 25 miles in a north-easterly direction. The breadth is at first nearly 6 miles, narrowing to less than a mile at a distance of 5 miles within; it then runs in a north-easterly direction 13 miles, when it branches off in two arms, one extending to the south-eastward for 12 miles, and terminating in low land. The other lies northward of, and is connected with, the sound by a straight narrow pass about 2 miles long; its length is 22 miles in an east and west direction, and the eastern extreme, Rupert arm, is only 6 miles distant from Hardy bay on the north-east side of Vancouver island; the western part terminates within 12 miles of San Josef bay on the outer coast. Just within the entrance of the sound on the north side is Forward inlet, a much smaller arm, about 6 miles long in a northerly direction, and containing the best anchorages of the sound.

The soundings in the entrance, and from 3 to 5 miles outside, vary from 30 to 70 fathoms, but within they deepen in many places to upwards of 100 fathoms. There are several dangers along the south shore at the entrance; in the fairway are two very dangerous rocks, which only break in heavy weather, and it requires great caution on the part of the navigator to avoid them when entering or leaving the sound.

Tides.—It is high water, full and change, in Quatsino sound at 11h.; the rise and fall of the tide is about 11 feet.

The islands and reefs at the entrance to Quatsino sound are the following:—Danger rocks, Entrance island, Pinnacle island, Surf islets, Bare islets, and Pilley shoal. Within Forward inlet on the western side are Low islets and Robson island.

Danger Rocks.—These small rocks are at about a mile within the entrance, nearly in the fairway, and consist of two very dangerous pinnacles steep-to on all sides. North Danger lies 7 cables E.N.E. from Entrance island, and breaks at low water. South Danger is half a mile S.E. of the north rock, and is awash at low water spring tides;—there is deep water between them.

Pinnacle islet in one with the east point of Low islands (in Forward islet), bearing N.N.W. $\frac{1}{2}$ W., leads nearly 4 cables westward of Danger rocks, and midway between the north rock and Entrance island. Robson island in Forward inlet, open north of

Entrance Mount point N.W. by W. $\frac{1}{2}$ W., leads 3 to 4 cables eastward of the rocks. Village islet, on the east side of Forward inlet, just touching Brown point, N.W., leads about three-quarters of a mile eastward of them, and midway between them and the Surf islands. Bedwell islets, within the sound on the north side, open north of Bold bluff bearing N.E., leads a quarter of a mile northward of North Danger rock; and Bold bluff in line with the gap in the centre of Surf islands, bearing N. by E. $\frac{1}{4}$ E., leads nearly a mile south-eastward of South Danger.

As the sea very seldom breaks over Danger rocks, great caution is required when entering or leaving Quatsino sound, to avoid them. Between the rocks and Surf islands the passage is $1\frac{1}{2}$ miles wide, and clear of danger.

Entrance Island is a small rocky islet, about 140 feet high and covered with a few stunted trees, situated on the north-west side of the entrance to the sound at about a cable's length from the shore. It is steep to on its south-east side, there being a depth of 16 to 22 fathoms at a very short distance from it. The narrow channel between it and the shore is filled with rocks, but it is sufficiently deep to permit the passage of boats. The geographical position of the island is lat. $50^{\circ} 26' 30''$, long. $128^{\circ} 8'$.

Pinnacle Island.—This is a little islet three-quarters of a mile northward of Entrance island, and on the same side (the western) of the entrance to the sound. It is a small rugged rock about 40 feet high, having a few trees on its summit. Its distance from the shore is 2 cables, and at a cable from its east side is a depth of 15 fathoms. When off this islet Forward inlet appears open.

Surf Islets.—These consist of a chain of small islands one mile long in a N.W. and S.E. direction, situated about a mile S.S.W. from Bold bluff, and 8 miles within the entrance to the sound; they are consequently nearly in mid-channel. Some of them are covered with a few stunted trees, and are about 40 feet above the surface at high tide; a short distance from them are a number of breaking rocks, and at only 3 cables from their south and west sides is a depth of 10 to 30 fathoms. Although there appears to be deep water between these islands and the east side of the sound, it is not advisable to go through that passage, as it has not been sufficiently examined.

Bare Islet lies off the north shore of the entrance to the sound, at a little eastward of the entrance to Forward inlet. It is a very small bare rock, only 12 feet above the surface at high tide, and almost close to it is a depth of 24 fathoms. The passage between it and the shore is not more than $1\frac{1}{2}$ cables wide, and too shallow for anything larger than boats.

Pilley Shoal is a small patch of 8 fathoms, situated off the north shore of the entrance to the sound at about a mile north-eastward from Bare islet; from it Bold bluff bears almost due East, distant one mile. It is $1\frac{1}{2}$ cables from the shore, has a depth of 10 to 12 fathoms almost close to it, and is marked by kelp.

Low Islets.—These are small wooded islets situated nearly a mile within the entrance to Forward inlet, on its south-western side. They are steep, and close to them on all sides is a depth of 17 to 20 fathoms.

Robson Island is about half a mile north-westward from Low islets, on the same side of the inlet. It is about half a mile in extent, 385 feet high, and is separated from

the western shore by a narrow channel of 12 to 27 and 30 feet. Its shores are rocky, and on its north and east sides free from danger beyond the distance of a cable. On the western side of this island is North harbour, in which is excellent anchorage.

Forward Inlet.—On the north side of Quatsino sound, at a mile within the entrance, is the arm known as Forward inlet. This inlet is about 6 miles long, first taking a north-westerly direction for 2 miles from its outer part, and then turning to the N.N.E. for 4 miles and contracting in breadth as it approaches its head, where it terminates in large salt-water lagoons. The breadth at the entrance is about a mile, but in the upper part it contracts to less than a quarter of a mile in some places. Within it are two anchorages, named North and Winter harbours, in which vessels may ride in perfect security and be sheltered from almost all winds.

North Harbour, as already mentioned, is on the west side of Robson island, and its position makes it the most convenient of the anchorages in Forward inlet. Its extent is nearly half a mile, and within it is a depth of 4 to 6 fathoms. The entrance is 3 cables wide, and easy of access to sailing vessels. The western part of the harbour takes the name of Browning creek; this part is $1\frac{1}{2}$ miles long, but very narrow, with from 2 to 5 fathoms water, and terminates in a shallow basin, dry at low water.

On the north side of the entrance to North harbour is Observatory islet, a small bare rock connected at low water to the main; its geographical position is lat. $50^{\circ} 29' 25''$, long. $128^{\circ} 8' 39''$.

Winter Harbour comprises the N.N.E. part of Forward inlet and is a capacious anchorage having a depth of 8 to 11 fathoms. Its shores are low and bordered by a sandy beach, and the harbour becomes shoal at a distance of a mile from the head; its breadth varies from 2 to 6 cables.

Log point, just outside the entrance on the east side, is low, and bordered by a sandy beach. Southward of this point, and extending 4 cables from shore, is New Bank, with $8\frac{1}{2}$ fathoms on the shallowest part, which contracts the breadth of the entrance passage to the harbour to less than a cable; when running in keep a little over to the west side as soon as abreast North harbour, by which means this bank may be avoided and Winter harbour entered without danger.

At the narrowest part of the entrance to Winter harbour, on the west side, is a low grassy point bordered by a sandy beach and steep-to, there being 10 fathoms within half a cable of it.

Koprino Harbour.—At about 8 miles within the entrance of Quatsino sound, in the centre of a bay on the north side of the sound, is Koprino harbour, a perfectly land-locked but small anchorage, sufficiently capacious to accommodate one or two ships. It lies northward of Plumper island, which is about half a mile in extent, low, wooded, and steep-to on all sides, there being a good passage on either side of it into the harbour.

Dockyard Island, in the west part of the harbour, midway between Plumper island and the north shore, is small, but may be closely approached. The least water between it and Plumper island is 4 fathoms;—at about $1\frac{1}{2}$ cables north-eastward of it, in the middle of the harbour, is a small patch of 15 feet, known as the mud bank. There is good anchorage at a cable southward of Dockyard island, in 14 fathoms.

Wedge Island lies at the eastern limit of the anchorage at about a cable northward of *Plumper island*. It is very small, covered with a few bushes, and there is a deep passage into the harbour close to it on each side.

Observatory Islet.—At the north-east extremity of the harbour is a bare rock about 12 feet high, named *Observatory islet*. It is 2 cables northward of *Plumper island*, and 8 cables from the north shore, to which it is connected by a bank dry at low water. The geographical position of this islet is lat. $50^{\circ} 30'$, long. $127^{\circ} 52' 16''$.

East Passage leads into *Koprino harbour*, eastward of *Plumper island*. It is half a mile wide at the entrance, narrowing to 2 cables at its termination, is clear of danger, and the soundings in it vary from 15 to 80 fathoms. East cove, in its north-east part, appears to afford a good anchorage in 6 to 10 fathoms; but the entrance to it has hardly been sufficiently examined to recommend its being used by a large vessel. *Prideaux point*, the east entrance point of *East passage*, is low, bordered by a sandy beach, and may be approached to a cable's length.

Directions.—The following instructions for *Quatsino sound* are from the *Vancouver Island Pilot*. For a full detailed description of the sound and its inlets, reference should be made to that work, and also to the Admiralty charts, Nos. 582 and 570.

"*Entering Quatsino sound from southward*, give *Reef point*, its south-eastern entrance point, an offing of about 2 miles, and steer North till *Bold bluff* comes in line with the gap in the centre of the *Surf islands*, N. by E. $\frac{1}{2}$ E., which mark kept on will lead south-eastward of *Danger rocks*; when the west side of *Robson island* comes open north of *Entrance Mount point* in *Forward inlet*, N.W. by W. $\frac{1}{2}$ W., or *Village islet* (on the east side of that inlet) is just touching *Brown point*, bearing N.W., a vessel will be well east of these rocks. If bound up the sound, round the north end of *Surf islands* at a distance of about half a mile. If going to *Forward inlet*, steer about N.W. by W., taking care not to shut in the south side of *Robson island* with *Entrance Mount point*, until *Bedwell islets* come open north of *Bold bluff*, bearing N.E., when she will be well north of the *Danger rocks*. Pass from one to 2 cables off the east sides of *Low* and *Robson islands*, and rounding the north point of the latter, at the same distance, enter *North harbour*, and anchor in from 4 to 6 fathoms, near its centre.

If intending to anchor in *Winter harbour*, when abreast the north part of *Robson island*, steer N.N.W., keeping well over to the west shore to avoid *New Bank*, and when past it enter the harbour in mid-channel, anchoring in 11 fathoms at about half a mile north of *Grass point*.

Winter and *North harbours* are the best anchorages in *Quatsino sound*, and easily available for sailing vessels, which could beat into the latter harbour. As they are situated near the entrance to the sound their position is very advantageous.

Bound to *Koprino harbour*, which can only be entered by steamers or sailing vessels with a fair wind, round the north-west point of *Surf islands* at about half a mile distance, and steer up the sound in mid-channel until abreast the harbour. If in a large vessel, go through the *East passage*, keeping from one to 2 cables off *Plumper island*; enter the anchorage close to on either side of *Wedge island*, and moor immediately the vessel is west of it,—anchors north and south. A vessel may also enter by *West passage*, and anchor in 14 fathoms south of *Dockyard island*.

When navigating the sound eastward of Koprino harbour the chart is the best guide, and a mid-channel course is everywhere free of danger; sailing vessels of any size should not, however, go eastward of that harbour, as the anchorages beyond are rather difficult of access for them. If wishing to anchor in Hecate cove, enter it in mid-channel, passing north of Limestone island, and moor immediately the vessel is inside the entrance points; the tide runs from one to 3 knots abreast the entrance, and should be guarded against.

Going through Quatsino narrows, keep well over to the north shore, pass north of Round island, round Turn point close-to, and guarding against the tide, steer up the narrows in mid-channel. These narrows ought not to be attempted except at slack water, or with a favourable tide, unless in a full-powered steamer.

The best anchorage north of the narrows is Coal harbour in West arm. If wishing to go there, a N.W. course for 2 miles from the narrows will lead to its entrance; a vessel may anchor near its centre in from 12 to 14 fathoms. In navigating West arm keep well over to the south shore, when in the vicinity of the Pot rock and Straggling islands.

Entering Quatsino sound from westward, give the coast an offing of about 2 miles, till Entrance island bears N.E. or N.E. by N., when steer to pass about 2 cables eastward of it, but not farther off. When abreast it haul to the northward, bringing Pinnacle islet in line with the east side of Low islets, bearing N.N.W. $\frac{1}{4}$ W., and steer up with that mark on till Bedwell islets come well open northward of Bold bluff, bearing N.E., when Forward inlet may be entered, or you may proceed farther up the sound, as before directed.

If, when coming from southward, Pinnacle and Low islets can be well made out, a vessel by keeping the former in line with the east part of the latter, bearing N.N.W. $\frac{1}{4}$ W., will pass 8 cables westward of Danger rocks; but as a rule it would be more prudent to go eastward of them.

If the weather be so thick that the marks for clearing Danger rocks cannot well be made out, a vessel, if able to distinguish Entrance island, may enter the sound by steering for it on a N. by E. or north-easterly bearing; pass close to its east side, and haul to the northward when abreast it; by keeping half a mile on that course, she will be well clear north-west of Danger rocks, and may proceed anywhere up the sound. On a clear night in fine weather a vessel may also enter in the above manner.

There is room, with a steady breeze, for a smart working vessel to beat into the sound southward and eastward of Danger rocks, though without previous knowledge of the place it would be rather hazardous to attempt it. If obliged to do so, when standing northward towards Danger rocks, tack when Bold bluff comes in line with the centre of the northernmost (wooded) Surf island, bearing N.N.E. $\frac{1}{4}$ E.; and when standing to the south shore, tack when Bold bluff comes in line with the south-east extreme of the Surf islands bearing N. $\frac{1}{4}$ E. or N. by E. When the south side of Robson island comes open north of Entrance Mount point, N.W. by W. $\frac{1}{4}$ W., she will be eastward of Danger rocks, and may stand farther to the northward.

Beating between Surf islands and Danger rocks, tack at about 8 cables off the former; and in standing towards the latter, keep Robson island open as before directed,

till Bedwell islets come open northward of Bold bluff, N.E. If going to North harbour, when inside Forward inlet, guard against New bank."

THE COAST.—From Quatsino sound to cape Scott, the north-west extremity of Vancouver island, the coast trends W.N.W. about 26 miles. It is in general rocky and iron-bound, and from its projecting points sunken ledges extend a considerable distance, hence it is always prudent to give this coast a wide berth,—an offing of at least 2 miles is recommended. The mountains over the cliffs are occasionally more than 1000 feet high; of the headlands, cape Palmerston, in lat. $50^{\circ} 36' 45''$, rises to the height of 1422 feet, and has rocks at its base to about half a mile out, immediately beyond which is a depth of 6 to 10 fathoms.

San Josef Bay.—This inlet is on the north-west side of cape Palmerston, and should only be used as an anchorage when the wind is from the land. It extends 8 miles in a north-easterly direction, and has a breadth at the entrance of nearly 2 miles, narrowing gradually towards its head. Its shores are high, and off the south side are several isolated rocks. Although the depth of the bay is 11 to 4 fathoms, it affords shelter only with northerly winds, and should not therefore be used as a stopping place unless the weather be fine; generally a heavy sea sets into it, and a vessel caught there with a south-westerly gale would inevitably go on shore. At its head, on the south side, is a stream of considerable size, which boats can enter at high tide.

The best place of anchorage in the bay is near the middle in 7 or 9 fathoms, with the entrance points bearing South and West.

Sea Otter Cove.—Outside the entrance to San Josef bay, on its north-west side, is a cluster of islands about 40 feet high, bare and yellow-topped, which with the coast northward of them form a little bay, known as Sea Otter cove. This bay extends into the land about a mile in a northerly direction, and is not more than one-third of a mile wide. It has a depth of 5 to 6 fathoms, and is exposed to southerly winds. There are several sunken rocks within it, and the shelter is very indifferent; it should be entered only by those well acquainted with its dangers.

Sea Otter cove is formed on its west side by cape Russell, a remarkable headland, 870 feet high, which is very conspicuous, especially when viewed from north-westward, as it stands out from the general line of coast. This cape must be rounded with very great care, on account of some sunken rocks which extend off it about a mile in a southerly direction. From this headland to cape Scott there is no place of shelter, and the bold coast frequently rises to the height of 600 feet.

The soundings off shore between Quatsino sound and cape Scott are deep, as might be inferred from the mountainous character of the adjoining land. At the distance of 2 miles the depth is 20 to 30 fathoms, sand and rock, and this deepens to 100 fathoms at 10 to 11 miles out; southward of Scott islands the depth of 100 fathoms is probably not more than 6 miles from them.

CAPE SCOTT is a bold headland 500 feet high, which will be recognised at once from whatever direction it may be viewed; for when bearing due East the sea will be observed to wash its north and south-sides, and when bearing either North or South the low sandy neck immediately behind it (only a cable wide, and which connects it to

the shore of Vancouver) makes it appear almost isolated. Its geographical position is lat. $50^{\circ} 46' 41''$, long. $128^{\circ} 26' 45''$. The country in the vicinity of the cape is not so lofty as that along the coast we have been describing south-eastward of it.

Cape Scott should always have a wide berth given to it because of the rocks at its base, which extend out nearly three-quarters of a mile; as these are steep, with a depth of 15 to 20 fathoms almost close to them, more than ordinary care is required when in their neighbourhood. The flood here comes from the southward, and rounding the cape sets into Goletas channel, its strength varying from one to 8 knots.

There is anchorage for boats and small craft in each bay on the north and south sides of the cape, formed by the sandy isthmus, but in neither is it safe to remain when there is a prospect of bad weather. The south bay has a depth of 5 to 2 fathoms, is exposed to South winds, and facing it is a cluster of rocks, some of which are 10 feet high. There is also shelter for boats in a little creek, among the rocks immediately west of the south bay; it is difficult of access, but affords protection when within even against southerly gales.

SCOTT ISLANDS.—The highest part of Cox, the easternmost island, is $5\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. from cape Scott. The channel between this island and the shore of Vancouver is safe and believed to be free from sunken dangers, with the exception of those already mentioned as surrounding cape Scott; its depth is from 19 to 40 fathoms. The tide runs through it at the rate of one to 8 knots, and there are some strong tide rips on its east and west sides. When beating through do not approach the shore of Cox island nearer than half a mile, nor that of cape Scott nearer than $1\frac{1}{2}$ miles.

The islands extend from Cox island about 20 miles in a westerly direction, the west point of Triangle island (the farthest to seaward), being in lat. $50^{\circ} 51' 58''$, long. $129^{\circ} 6' 32''$, and $25\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. from cape Scott. They are five in number, and reckoning from eastward are named Cox, Lanz, East Haycock, West Haycock, and Triangle; but adjacent to them are some smaller islets or rocks. The depth along their north sides, at the distance of 2 miles is 80 to 50 fathoms; at 2 miles westward of Triangle island it is 45 fathoms, and at 5 or 6 miles southward from them 80 to 100 fathoms.

Cox Island has an extent of about $2\frac{1}{2}$ miles. It is the largest of the islands, and rises to the height of 1047 feet. Its shores are very bold, and should not be closely approached because of detached rocks and sunken reefs. Vessels in fine weather occasionally anchor off the north shore in 14 fathoms; but it is safe to do so only when the wind is from southward.

Lanz.—This island is distant from Cox island about half a mile; the channel between is 17 fathoms deep in the middle, but should be used only on an emergency, as the shore on each side is rocky. Lanz is 2 miles long in a westerly direction, one mile broad, and is the highest of the Scott islands,—its summit being 1177 feet above the sea.

East Haycock is $2\frac{1}{2}$ miles south-westward from Lanz island; it is very small, has a rugged outline, and is covered with a few stunted trees. Some islets or rocks extend a short distance N.W. from it.

West Haycock is distant 5 miles W. $\frac{1}{2}$ S. from East Haycock. It is small and rocky, and about 180 feet high; some small islets extend upwards of a mile south-westward from it, foul ground existing around them for half a mile.

Triangle, the westernmost of the Scott islands, is 26 miles W. by S. from cape Scott. It is 680 feet high, about a mile in extent, and differs from the other islands in being very precipitous, and bare of trees, and has a remarkable gap in its summit. A ledge or reef extends one mile north-west from it; eastward of it are three low islets, the outermost of which, 40 feet high, is $1\frac{1}{4}$ miles from the island; there are also two islets at a short distance from its south side.

The Scott islands have not been closely examined, but it is known that strong tide ripples and overfalls prevail in the channels separating them. Upon this account, and also because these channels have not been sounded, vessels should abstain from venturing near or among them. The flood sets northward and the ebb southward through the islands, and at times with considerable strength.

COAST OF BRITISH COLUMBIA NORTH OF VANCOUVER ISLAND.

Magnetic Variation in 1880:—*Queen Charlotte Sound* $24\frac{1}{2}^{\circ}$ E.; *Seaforth Channel* $25\frac{1}{2}^{\circ}$ E.; *Principe Channel* 27° E.; and *Chatham Sound* 28° E.

It is estimated to increase 2 to 3 minutes annually.

The following sailing directions relating to Queen Charlotte, Smith, and Fitz-Hugh sounds, with channels leading to Milbank sound, are by Navigating Lieutenant Daniel Pender, R.N., in charge of the British Columbia Admiralty Survey, 1867.*

QUEEN CHARLOTTE SOUND—Shadwell Passage.—The south peak of Magin saddle (on the west end of Galiano island) in line with the east end of Centre island bearing S.S.E., leads through the northern entrance of Shadwell passage, passing half a mile east of cape James (north-west point of entrance), and $1\frac{1}{4}$ cables west of Breaker reef, in 9 to 17 fathoms water.†

Pine and Storm Islands.—These islands with their surrounding islets and reefs occupy the middle of the western approach to Queen Charlotte sound, and form the eastern margin of dangers between Shadwell passage and cape Caution.

Pine island, bold, rocky, and covered with trees, about 250 feet high, is $4\frac{1}{4}$ miles N.E. by N. from cape James.

Storm islands are a narrow chain of islands lying in an East and West direction about 2 miles long, and form a most useful land-mark when crossing Queen Charlotte sound. The western of these islands bears from Pine island N.W. by N. 8 miles; from cape James N. $\frac{1}{2}$ E. $6\frac{1}{4}$ miles; and from cape Caution S.E. by S. distant 8 miles.

* Reprinted from the Admiralty *Hydrographic Notice*, No. 24, 1877.

† See Admiralty chart "Goletas channel to Quatsino sound," No. 582.

There are no outlying dangers beyond 8 cables. The tops of the trees are 150 to 200 feet high, and on the western part is a *single tree* which is conspicuous.

A sunken rock, on which the sea breaks in bad weather, lies about 5 miles N.E. of Shadwell passage; from the centre of the rock Bright island bears S.E. $\frac{1}{2}$ E., distant $1\frac{1}{2}$ miles, and Pine island, West $1\frac{1}{2}$ miles.

Sealed Passage, 5 miles to the northward of Shadwell passage, between Pine island and Storm islands, is about $2\frac{1}{2}$ miles wide, and has a reef (Blind reef), on which the sea breaks in heavy weather, extending nearly across; close to the west edge of Blind reef there are 17 to 40 fathoms, rock. This passage should not be attempted.

Reid island, the easternmost of the Storm islands, on the north side of Sealed passage, is about 800 yards long E.N.E. and W.S.W., and 150 yards broad, having a rock above water half a cable off its west end.

Water can be obtained at the Indian fishing station on Storm islands.

South Rock, awash at low water, lies about $1\frac{1}{2}$ miles north-eastward of Blind reef; from the centre of this rock, Pine island bears S.W. by S. $3\frac{1}{2}$ miles nearly, and Reid island W. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles.

Middle Rock, on which the sea nearly always breaks, is covered at three-quarters flood, and lies N. by W. one mile from South rock.

North Rock, on which the sea nearly always breaks, is awash at high water, and lies N.E. three-quarters of a mile nearly from Middle rock. Harris islet a little open south of Janette island, bearing E. by S. $\frac{1}{2}$ S., leads half a mile to the northward of North rock.

CAPE CAUTION (Ka-Klees-la), the north-west entrance point of Queen Charlotte sound, is of moderate height and level, the tops of the trees being about 200 feet above the sea; the shore is white, and of granite formation, with a few rocks off it; the land north-east of the cape rises gradually in a distance of 5 miles to Coast nipple, 1850 feet high, 2 miles to the eastward of which lies mount Robinson, 2100 feet high.

Soundings.—In a south-westerly direction from cape Caution, at a distance of 8 cables, there is a depth of 9 fathoms, rocky bottom; at one mile, 16 fathoms; at $1\frac{1}{2}$ miles, 48 fathoms, white sandy bottom; thence for 7 miles in the same direction the average depth is 70 fathoms, rocky bottom. At 10 miles S.W. by W. from the cape and $2\frac{1}{2}$ miles S.E. $\frac{1}{2}$ S. from Danger rock the water shoals to 40 fathoms dark sand, and again deepens to 80 and 90 fathoms a short distance to the southward.

SEA OTTER GROUP.—This group, consisting of several dangerous rocks, islets, and shoals which cover a space about 12 miles in extent north and south and 10 miles in an east and west direction, lies 6 or 7 miles from the seaboard of British Columbia, fronting the coast between capes Caution and Calvert.*

Danger shoal, on which the sea is reported to break in heavy weather, is the southernmost outlying danger of Sea Otter group, and lies W. by S. $\frac{1}{2}$ S. $10\frac{1}{2}$ miles from cape Caution; near the centre of this shoal there is a depth of 9 fathoms, with 22 fathoms close around. Shoaler water probably exists.

* See Admiralty chart, "Approaches to Fitz-Hugh and Smith sounds," No. 2448; and "Cape Caution to port Simpson," No. 1928, A and B.

Virgin Rocks, near the western limit of the group, consist of three white rocks, the largest of which (50 feet high) lies N.W. by W. $\frac{1}{2}$ W. $7\frac{1}{2}$ miles from Danger shoal, and West 17 miles from cape Caution. Southward of these rocks the 80-fathom line is 4 miles, and in a westerly direction it is 6 miles distant: rounding this part the soundings should not be reduced to less than 80 fathoms.

Watch Rock, 74 feet high and black, lies near the northern limit of the group, N. $\frac{1}{2}$ E. $7\frac{1}{2}$ miles from Virgin rocks. The rock is steep-to.

Pearl Rocks, the northernmost of Sea Otter group, comprise several rocks above and below water, extending $1\frac{1}{2}$ miles in a north-west and south-east direction; the largest rock (15 feet high) lies E. by N. 8 miles from Watch rock, and the south-east rock, on which the sea always breaks, lies S.E. by E. one mile from the largest rock; there are 15 to 31 fathoms water close-to on the north side of Pearl rocks, and 70 to 80 fathoms just eastward of them.

Devil Rock, the north-eastern outlying danger, lies N.E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from the largest Pearl rock, and S.S.W. $\frac{1}{2}$ W. nearly 8 miles from Sorrow islands. The sea seldom breaks on Devil rock, and there is apparently deep water close around. There are 80 to 40 fathoms between the rock and cape Calvert.

Hew Patch, on which the sea generally breaks, is nearly 2 miles in extent, and lies S. by E. $4\frac{1}{2}$ miles from the largest Pearl rock.

Channel Reef, the easternmost danger of Sea Otter group, has about 6 feet over it at low water; from the centre of this reef, Table island, at the entrance of Smith sound, bears E. by N. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles and Egg island E. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles. The sea seldom breaks on Channel reef, and there are 60 fathoms close eastward of it.

Hannah Rock, the south-easternmost outlying danger on which the sea is nearly always breaking, is situated about $2\frac{1}{2}$ miles south of Channel reef; Hannah rock is awash at high water, and from its centre cape Caution bears E. $\frac{1}{2}$ S. 8 miles, Egg island N.E. by E. $5\frac{1}{2}$ miles, and Danger shoal S.S.W. $\frac{1}{2}$ W. $4\frac{1}{2}$ miles.

The south extremes of Egg and Table islands in line, bearing N.E. $\frac{1}{2}$ N. leads clear to the south-eastward of Danger shoal, and all other dangers on the south-east side of Sea Otter group.

Directions.—To enter *Fitz-Hugh* sound from southward, after passing cape James (Shadwell passage), a N.N.W. $\frac{1}{2}$ W. course should be steered (or for Entry peak, 1200 feet high, the south conical mountain over cape Calvert) until past the Storm islands; when, Addenbrooke island open of, and the east shore of *Fitz-Hugh* sound (beyond) shut in by cape Calvert, bearing N.N.W. $\frac{1}{2}$ W., will lead midway between Channel reef and Egg island, and up to the entrance of *Fitz-Hugh* sound. Allowance should be made for tidal streams: the flood sets to the eastward into Queen Charlotte and Smith sounds with a velocity at springs of nearly 2 knots. See p. 357.

From westward.—Vessels from westward, bound for *Fitz-Hugh* sound, should use North passage, between Sea Otter group and Calvert island; this passage is about 8 miles wide, with depths of 80 to 71 fathoms; Hedley patch with 9 fathoms water (probably less) lies in the west entrance to North passage, at $8\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Watch rock. See description of Sea Otter group, p. 358.

South Passage.—This passage, leading to Smith and *Fitz-Hugh* sounds from the

southward, lies between cape Caution and the south-east limit of Sea Otter group, where it is about 7 miles broad, with irregular soundings varying from 34 to 74 fathoms. False Egg island, its own breadth open west of Egg island, bearing N. $\frac{1}{2}$ W., leads through South passage, nearly in mid-channel.

Munden Bay, a slight bend in the coast between cape Caution and Neck point, at $1\frac{1}{2}$ miles N.W. $\frac{1}{2}$ N. from it, is about one mile wide at its entrance, and nearly a mile deep; Indian cove, which lies in the northern part of this bay, affords good shelter for boats; it is the Indian rendezvous on their canoe voyages, when passing between Queen Charlotte and Fitz-Hugh sounds.

From Neck point the coast trends N. by W. 2 miles to Good Shelter cove, midway between which lies Hoop reef, about one-third of a mile from the shore; this reef is three-quarters of a mile north-west and south-east, and one-quarter of a mile broad.

Iron Rocks.—*South Iron rock*, on which the sea seldom breaks, lies three-quarters of a mile to the westward of Hoop reef, and nearly $1\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from Neck point; there are 35 fathoms close-to, on the north side of the rock, and 25 fathoms in the channel between it and Hoop reef. *North Iron rock*, which dries 7 feet, lies nearly in the fairway of *Alexandra passage*, N.N.W. $\frac{1}{2}$ W. three-quarters of a mile from South Iron rock; there are 7 to 9 fathoms close-to, and no bottom at 40 fathoms within a quarter of a mile of North Iron rock.

False Egg island in line with West rock, off Table island, bearing N. by W. $\frac{1}{2}$ W., leads 4 cables west of South and North Iron rocks. The west extreme of Surf islet and the small islands near the south point of Shower island in line, N.E. by N., leads through *Alexandra passage*, between North Iron rock and Egg rocks.

Egg Island, immediately fronting Smith sound, and standing boldly out from the coast, is the prominent landmark between Goletas channel and Fitz-Hugh sound. The island is 280 feet high, covered with trees, and is remarkable for its egg-like shape; it lies N.W. $\frac{1}{2}$ N. 5 miles from cape Caution. From the south-west side of the island rocks extend out about a cable, and on the east side lies a small island, which is separated from Egg island by a narrow gully, giving the appearance of a split in the island itself, when seen from north or south.

Egg Rocks, on the west side of *Alexandra passage*, are a cluster of rocks lying nearly three-quarters of a mile W.N.W. from North Iron rock, and S.S.E. about 2 cables from Egg island; these rocks extend about a quarter of a mile N.N.W. and S.S.E., the northernmost being 80 feet high.

A sunken danger (*Denny rock*), on which the sea seldom breaks, and is a source of anxiety in thick weather, lies a quarter of a mile W.S.W. from the southernmost Egg rock. The west extreme of Ann island open west of Egg island bearing N. by E. leads about 3 cables west of Denny rock.

SMITH SOUND.—This sound lies 6 miles N.N.W. from cape Caution; it is about 8 miles long N.E. and S.W., with an average breadth of $3\frac{1}{2}$ miles; the entrance, between Jones point and Long point, being $5\frac{1}{2}$ miles across in a N.N.W. direction. Six miles within the entrance on each side of a cluster of islands is a channel leading into Smith inlet. In almost every part of the sound the depths are over 40 fathoms, and there is generally a heavy swell.

The south-east shore of Smith sound, for a distance of 4 or 5 miles from the entrance, is fronted by several small islands and rocks having deep water close-to; good shelter for boats will be obtained in a small cove about a quarter of a mile north of Jones point, the south entrance point of the sound, also in a cove one mile south of Jones point, abreast Egg rocks.

The entrance to the sound is protected by a plateau, on which stands a collection of islands, islets, and rocks; some above, and many under water, prominent amongst them being Egg and Table islands, already described. Access to Smith sound may be had on either side of these islands.

Alexandra Passage.—The south passage is between Egg island and the south-eastern point of entrance, the narrowest part, between Egg rocks and North Iron rock, being 6 cables: here as elsewhere, however, the dangers are so steep-to, that the *quickest* use of the lead is enjoined. A general leading mark through Alexandra passage (making allowance for heave of swell and tide) is, the west extreme of Surf island in line with the islets near the south point of Shower island bearing N.E. by N.

Beaver Passage.—The northern channel into Smith sound is between the islands fronting the north point of the sound and Wood and White rocks, the northern and north-western extension of the above mentioned plateau, *see* detailed description of the several dangers. In Beaver passage the bottom is irregular, 20 fathoms being the least depth obtained. The course through the passage is E. $\frac{1}{4}$ S., the east extreme of Search islands just open of the west end of Surf islet on that bearing, leads in mid-way between John reef (on south side) and False Egg island (on north side), where the width is 6 cables. This western entrance to the passage being the narrowest part; with the usual amount of sea and swell, good steerage, and vigilant attention are required.

Table Island, the largest of the group of islands occupying the entrance to Smith sound, is about one mile long north and south, and half a mile broad, with the tops of the trees 120 feet above the sea, nearly flat. Table island when seen from abreast cape Caution makes with two summits.

A cluster of rocks, several of which are covered at low water, extends half a mile from the west side of Table island, having 24 fathoms water close to the outer rock.

Ann Island, about half a mile in extent, is separated from the north end of Table island by a channel (a cable wide in some parts) in which shelter will be found for boats.

Cluster Reefs, consisting of several rocky heads and shoal patches, extend from Table island in a northerly and north-westerly direction into the entrance of Smith sound. George rock, on which the sea breaks at low water, is the north-westernmost, and lies N. by W. $\frac{1}{4}$ W. one mile from Ann island; Edward reef dries 7 feet, and lies E.N.E. three-quarters of a mile nearly from George rock. Wood rocks, which are awash at low water, lie E. by N. a quarter of a mile nearly from Edward reef, consist of three rocky heads, and are the north-easternmost of Cluster reefs. Bertie rock, with 8 $\frac{1}{2}$ fathoms water, lies near the eastern edge of Cluster reefs; from the centre of this rock the north-west extreme of Ann island bears S.W. $\frac{1}{4}$ S. distant nearly three-quarters of a mile.

The west extreme of False Egg island in line with Kelp head, bearing N. $\frac{1}{2}$ W., leads to the westward; and Limit point, midway between Long and Shower islands E. by N. $\frac{1}{2}$ N., leads to the northward of Cluster reefs.

White Rocks, 35 feet high, and very conspicuous, lie in the west entrance of Beaver passage, and $8\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from Egg island, and nearly one mile north-west of Cluster reefs.

At 8 cables N.N.W. $\frac{1}{2}$ W. from White rocks and 6 cables S. by W. $\frac{1}{2}$ W. from False Egg island, lies John reef, which dries 8 feet at low water, with 9 to 20 fathoms close around; it forms the north-western danger, on the south side of Beaver passage.

The east extreme of Search islands just open south of the west end of Surf islet (east side of Smith sound) bearing E. $\frac{1}{2}$ S., will lead 8 cables to the northward of John reef, and into Smith sound through Beaver passage.

False Egg Island, resembling Egg island in shape, but smaller, is 150 feet high; it lies on the north side of Beaver passage, and is the outlying landmark for this northern entrance to Smith sound.

At about 8 cables W. $\frac{1}{2}$ N. from False Egg island lies James rock, the position of which is somewhat doubtful; the sea breaks on this rock at low water, and between it and False Egg island the bottom is foul.

The west part of the large Canoe rock bearing North, or in line with Quoin hill (on Penrose island) passes three-quarters of a mile westward of James and John rocks, and leads clear westward of all dangers at the entrance of Smith sound.

Long Point, the north-west point of Smith sound, lies E. by N. three-quarters of a mile from False Egg island. The island, which is nearly a quarter of a mile in extent, lies close westward of Long point, and is separated from it by a boat passage, in which there is a depth of 4 fathoms. Ada rock, which is awash at low water, lies S.S.E. $\frac{1}{2}$ E. 2 cables from Tie island.

Brown Island, on the north-east side of Beaver passage, lies S.E. $\frac{1}{2}$ S. half a mile from Long point; the island is 250 feet high, nearly half a mile long N.N.W. and S.S.E., and a quarter of a mile broad, with 17 to 23 fathoms close to its south point. Between the south part of Brown island and Wood rocks, the eastern part of Beaver passage is 8 cables across with 30 and 40 fathoms.

Surprise patch, on the north side of Smith sound, lies N.E. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from the south extreme of Brown island; there is a depth of 5 fathoms on this patch, 7 to 17 fathoms close around, and no bottom at 40 fathoms 2 cables to the northward.

Judd Rock, with less than 6 feet water, lies N.E. by E. $\frac{1}{2}$ E. three-quarters of a mile from Surprise patch, and W. by N. three-quarters of a mile from Long island, the largest of the Barrier islands; there is no bottom at 40 fathoms in the vicinity of this rock.

Barrier Islands, at the head of Smith sound, consist of two large and several small islands covering a space of about 5 miles in extent N.E. and S.W. Blakeney passage on the north, and Browning passage on the south side of these islands, each leading to Smith inlet, are each about one mile wide, with no bottom at a depth of 40 fathoms.

Takush Harbour, on the south shore of Smith sound, 6 miles within the entrance, and $1\frac{1}{2}$ miles east of Barrier islands, is 2 miles long, north-east and south-west, and

one mile broad. This is the only anchorage which a ship can make for shelter when crossing Queen Charlotte sound. Vessels of large size can lie here secure.

The entrance is three-quarters of a mile wide, with no bottom at 39 fathoms, decreasing to 22 fathoms, rock, in the centre of Ship passage, which is $2\frac{1}{2}$ cables wide, and is formed by Gnarled islands on the west, and Fish rocks (dry 8 feet at low water) on the east side.*

Fly Basin, at the head of Takush harbour, perfectly land-locked, is about one mile long E.N.E. and W.S.W., and one to 2 cables broad, with $2\frac{1}{2}$ to 3 fathoms in the western and 6 to 8 fathoms in the eastern part of the basin. The entrance to Fly basin, which is about one cable wide, is contracted to a quarter of a cable by a shoal extending from the east entrance point, with a rock (dry 2 feet at low water), and a patch of 9 feet on its western edge; between this shoal and the west entrance point there is a depth of 9 fathoms. If required a small vessel could be taken into Fly basin.

Anchorage in Takush harbour will be found in 10 or 11 fathoms, mud, in Anchor bight, midway between Ship rock and Steep point, with the north extreme of Bull point bearing N.E. by E. $\frac{1}{2}$ E., and east extreme of Bloxham point N. by E. $\frac{1}{2}$ E.

Tides.—It is high water, full and change, in Takush harbour at 1h. Om.; springs rise 14 feet, neaps 11 feet.

Directions.—When bound to Takush harbour, it is recommended to pass through Browning passage, and, after passing North point—*see plan*—keep the north extreme of Bright island a little open north of that point bearing W. by S. $\frac{1}{2}$ S., until Berry point (south side of Fly basin) appears midway between the entrance points of Fly basin, S.E., which will lead through Ship passage; and when Steep point is well open of the southernmost Gnarled island bearing W.S.W. a course may be steered for the anchorage in Anchor bight, passing midway between Anchor and Gnarled islands. Good steerage is required here, speed should be proportionately slow, the leads quickly kept going, and the water not shoaled to less than 7 fathoms.

Smith Inlet (Quas-cillah), the continuation of Smith sound, is about 9 miles wide at its entrance, between eastern part of Takush harbour and Dsoolish bay; it is said to extend nearly 25 miles in an E.N.E. direction. The inlet has not been surveyed.

FITZ-HUGH SOUND.—This sound, the entrance to which lies 5 miles to the northward of Smith sound, is 39 miles long in a general N.N.W. and S.S.E. direction, having an average breadth of 8 miles, with no known hidden dangers throughout. The southern entrance to Fitz-Hugh sound lies between Cranstown point on the east, and cape Calvert the southern extremity of Calvert island on the west, 5 miles W. $\frac{1}{2}$ N. from it.

Cranstown Point is at once the south entrance point of Fitz-Hugh sound and of Rivers inlet. The coast from Long point extends N.W. by N. $2\frac{1}{2}$ miles to Kelp point, from which Cranstown point bears N. by W. distant one mile.

Cance, Spur, and Paddle Rocks lie about a mile off Kelp point, and occupy a space of $1\frac{1}{2}$ miles in a N.N.W. and S.S.E. direction. The space thus enclosed being foul,

* See Admiralty plan of Takush harbour, on sheet "Approaches to Fitz-Hugh and Smith sounds," No. 2448.

and more or less covered with growing kelp. Canoe rock, the centre and most prominent of these rocks, is bare, 25 feet high, and stands boldly out from the coast, making a good point for identification. See clearing mark, p. 862.

Open bay, on the north-east side of Cranstown point, affords anchorage in 7 fathoms about 2 cables from the shore during summer or with off-shore winds, but there is generally a swell in the bay, and it is only used by local craft as a temporary anchorage.

CAPE CALVERT, the south extreme of Calvert island, is the southern termination of Cape range (2000 feet high). At 2 miles north of the cape lies Entry cone (1200 feet high), which is conspicuous, and forms a good mark for recognising Fitz-Hugh sound from the southward, and westward; cape Calvert is fronted by the Sorrow islands, which are steep-to, of granite formation, and covered with gnarled and stunted trees; between these islands and the cape fair shelter may be found for boats in Grief bay (Telakwas), but during south-east or south-west gales, a swell is more or less experienced, rendering landing difficult and sometimes dangerous. This bay is an Indian resort when travelling, or engaged in hunting the sea otter.

SCHOONER RETREAT.*—Schooner retreat (or Ka-pi-lah), on the east side of Fitz-Hugh sound, is the name given to the anchorages among a cluster of islands at the south-west end of Penrose island, which here separates Fitz-Hugh sound from Rivers inlet. The retreat affords a secure resting place, and with care may be safely entered by steam-vessels.

Joachim Island, the south-easternmost and largest of this cluster of islands, is 400 feet high, $1\frac{1}{2}$ miles long north and south, with an average breadth of half a mile; the north extreme of this island is separated from Penrose island by a boat passage.

Ironside island, the eastern part of which is 200 feet high, is the next in size, and is separated from Sea bluff, the north-west point of Joachim, by the channel into Schooner retreat.

Safe entrance, between Joachim and Ironside islands, three-quarters of a mile wide, has in the middle from 8 to 17 fathoms water; on the west side of Safe entrance lies a rock awash, about 50 yards from Grey islands, having a shoal extending $1\frac{1}{2}$ cables in a northerly direction, with 2 to 3 fathoms on it, and 4 to 10 fathoms close-to.

Comber rock, on which the sea often breaks, is an outlying danger at the north side of the entrance of Schooner retreat; the rock covers at three-quarters flood, and lies S. by W. three-quarters of a cable from Surf point, the south-west extreme of Ironside island.

Frigate Bay, the southernmost anchorage in Schooner retreat, is a space about half a mile long north-east and south-west, and a quarter of a mile broad, with depths of 9 to 20 fathoms; it is bounded on the south by Joachim island, and on the west by Ironside and Maze islands. The best anchorage in this bay will be found just within Safe entrance, off a clean sandy beach, in 18 fathoms water, with the north-east extreme of Ironside island bearing W. $\frac{1}{2}$ S., and the north-west extreme of Sea bluff S. $\frac{1}{2}$ W. It is necessary to moor in this bay.

Maze Islands are a cluster of small islands on an extensive shoal projecting in a

* See Admiralty plan of Schooner retreat on sheet No. 1901.

northerly direction from the north-east end of Ironside island; the north-east prong of this shoal extends nearly across to Penrose island, having a narrow channel with $5\frac{1}{2}$ to 9 fathoms water, which leads from Frigate bay to Secure anchorage.

Secure anchorage may be found north-west of Frigate bay, about a quarter of a mile long north-east and south-west, and $1\frac{1}{2}$ cables broad, with depths of 9 to 11 fathoms; it is protected from seaward by Ironside, Bird, and Highway islands. Verney passage, leading to Secure anchorage from the westward, between Ironside and Bird islands, is nearly half a cable wide with 7 fathoms water in mid-channel, but it is contracted to about 80 yards by the shoals on either side, and having Chance rock at the entrance is only suitable for small coasting vessels.

During S.E. and S.W. gales the gusts are furious, but with good ground tackle and care, there need be no danger in Schooner retreat.

Tides.—It is high water, full and change, in Schooner retreat at Oh. 30.; springs rise 14 feet, neaps 11 feet.

Directions.—Vessels bound to Schooner retreat should at all times use the Safe entrance;—from the southward Quoin hill (880 feet high), at the west part of Penrose island, brought in line with the hill, 200 feet high, on the east end of Ironside island, bearing N.N.E., will lead to abreast Karslake point, the west extreme of Joachim island, when Safe entrance will be open. After passing Karslake point steer very carefully and proceed at a moderate speed towards Bluff point until Quoin hill is in line with Centre island bearing N. $\frac{1}{2}$ E., which will lead through Safe entrance in mid-channel, and to the anchorage in Frigate bay.

The soundings between Karslake point and Safe entrance are irregular, varying from 24 and 30 fathoms abreast the point, to 40 fathoms no bottom within 2 cables of the entrance, thence decreasing gradually to 15 and 20 fathoms midway between Sea bluff and the southern Grey island.

Safety Cove.—Safety cove (or Oat-so-alis), on the west shore of Fitz-Hugh sound and 7 miles to the northward of cape Calvert, is about one mile long W.S.W. and E.N.E., and nearly half a mile wide at its entrance, to the westward of which the shores of the cove extend parallel to each other at a distance of 2 cables apart; there are depths of 9 to 17 fathoms within half a cable of the shores, and 14 to 19 fathoms, soft mud, in the middle of the cove, but the head is filled by a shoal extending out 3 cables, with 7 fathoms close to its edge. The north entrance point of Safety cove has two small islets lying off it, which are useful in identifying the entrance, especially when coming from the northward.

Good anchorage will be obtained in 18 fathoms, mud, in the middle of Safety cove, abreast a waterfall on the north shore. Entering at night, a vessel should keep in the middle of the cove, obtaining soundings, and anchor as soon as 17 fathoms are struck. During south-east or south-west gales, strong gusts blow across the valley at the head of this cove.

The stream which runs into the head of Safety cove affords excellent water, but is

* See Admiralty plan of Safety cove on sheet No. 1901.

difficult to obtain by boats. The waterfall on the north shore, unless in exceptionally dry weather (August and September), will afford a good supply.

Tides.—It is high water, full and change, in Safety cove, at 1h. 0m.; springs rise 14 feet, neaps 11 feet.

Observation spot, on the north shore, about $1\frac{1}{2}$ cables westward of the waterfall, is in lat. $51^{\circ} 81' 49''$, long. $127^{\circ} 56' 23''$, depending upon Shell island, Beaver harbour, being in long. $127^{\circ} 25' 7''$.

Fitz-Hugh sound, at 4 miles north of Safety cove, is contracted to $1\frac{1}{2}$ miles by Addenbrooke and adjacent islands, which lie on the east side of the sound; the shores on both sides are, however, steep-to, and the depths in the channel from 80 to 140 fathoms.

Kwakshua Passage, $7\frac{1}{2}$ miles north of Safety cove, leads to the sea, and lies between Calvert and Hecate islands; this passage is only partially examined; it has, however, been used by coasting vessels.

Hakai Passage, $5\frac{1}{2}$ miles north of Kwakshua, is an unexplored channel leading to the sea.

Goldstream Harbour,* at the south-east entrance of point Hakai passage, affords good accommodation for small vessels; it is about 2 cables long north and south, and 2 cables broad, with depths of 7 to 15 fathoms, sand and mud. The entrance to this harbour from Fitz-Hugh sound is through an intricate passage a little over half a cable wide, between the north extreme of Hecate island which forms the south shore, and an island about one mile in extent which forms the north side of Goldstream harbour. Evering rock, which dries 8 feet at low water springs, lies near the middle of the passage about 2 cables within the entrance; it would, therefore, be advisable in the absence of good local knowledge, to place a boat near this rock (when covered) before entering or leaving the harbour, and proceeding at slow speed, keep in mid-channel, where there is a general depth of 6 fathoms.

Tides.—It is high water, full and change, in Goldstream harbour at 1h. 0m.; springs rise 15 feet, neaps 12 feet.

Nalan Passage, 4 miles north-westward of Hakai, is an unexplored channel leading to the sea.

Namu Harbour,* at the south entrance of Burke channel, and one mile south of Edmund point, east side of Fitz-Hugh sound, lies N.E. by N. 6 miles from Nalan. It is three-quarters of a mile long, E.N.E. and W.S.W., and three-quarters of a mile broad, with depths of 20 to 28 fathoms; in the entrance of the harbour lies Kiwash, a round island, 200 feet high, a quarter of a mile in diameter, and covered with trees. South passage, between Kiwash and Plover island (150 feet high), which forms the south entrance point of Namu harbour, is nearly half a mile wide, with 28 to 29 fathoms water; North passage, between Kiwash and Cliff island, on the northern side of the harbour, is 8 cables wide with 35 to 18 fathoms water. Namu harbour may be entered either by North or South passage.

Anchorage.—Large vessels should anchor in 20 fathoms, in the centre of Namu harbour, with the north extreme of Kiwash island bearing West, and the west extreme

* See Admiralty plan of this harbour on sheet No. 1901.

of Plover island S. by E. Small vessels may anchor in Whirlwind bay on the east side of Namu harbour in 12 fathoms, clay, with the north extreme of Kiwash island bearing W. by S., and the centre of Olam island (a small island south of the bay) South. During the autumn and winter months the anchorage in Whirlwind bay is not recommended as the williwaws blow with furious strength over the mountains (8000 feet high) in its vicinity. This anchorage is moreover confined by Loo rock with 8 feet water, lying nearly in the middle of the bay, and E. by N. $\frac{1}{2}$ N. 2 cables from the south extreme of Sunday island.

There is a large stream and an old Indian camp in Whirlwind bay.

Burke Channel, on the east side of Fitz-Hugh sound, 3 miles northward of Namu harbour, leads to Bela-Kula anchorage at the head of North Bentick arm, a distance of 55 miles in a general north-easterly direction, from its junction with Fitz-Hugh sound.

Edmund Point, the south entrance point of Burke channel, has several small islands near it; and Walker point, the north entrance point to the channel, is formed by an island situated 2 miles north-west from Edmund point; this island is steep-to, but at a distance of 2 cables the water is not deeper than 26 fathoms, mud bottom, deepening quickly a short distance farther, a position which might be used in a fog for anchoring.

Temporary anchorage, north of Walker point, might on emergency (with care, and sending a boat ahead) be taken up, but there are many covering reefs.

Kiltik, on the west side of Fitz-Hugh sound, opposite Edmund point, is a narrow creek (less than 2 cables), extending nearly a mile in a westerly direction, with an average depth of 20 fathoms in the centre, but shoal for one third of a mile from its head. This creek it is supposed might be used by moderate sized vessels; but was not examined in detail.

Fog Rocks, situated rather on the east side of Fitz-Hugh sound and 3 miles north of Walker point, consist of six rocks above water, the highest of which is 25 feet high, with a few shrubs on it. These rocks (which appear nearly in mid-channel from southward) may be passed on either side at a distance of 9 cables, but the main route lies to the westward of them—there is a depth of 108 fathoms, mud, between Fog rocks and the eastern shore of Fitz-Hugh sound.

Port John.—Four miles north of Lama passage, on the eastern shore of Fisher channel, and 8 miles northward of Fog rocks, is an indentation with port John in its northern part, immediately under Remarkable cone; and terminating in Evans arm, to the southward.

Port John (of Vancouver) affords anchorage in 20 fathoms, but is much confined by Mark rock nearly in the middle of the place, and by the flat extending off the stream at the head. There is also anchorage at the head of Evans arm in 20 fathoms, which may be reached through South passage, but the immediate approach to it north of Boot island is foul, and a vessel of size should be preceded by a boat. North passage should only be used after temporarily buoying Peril rock.

LAMA PASSAGE* is the main passage connecting Fisher channel (which is the

* See Admiralty chart, "Lama passage and Benfirth channel," No. 2449.

northern continuation of Fitz-Hugh sound) with Seaforth channel and Milbank sound ; its eastern entrance, on the west side of Fisher channel and 6 miles north of Fog rocks, may be recognised by a conical mountain, 1000 feet high, on the north-east point of Hunter island, and by Pointer island, on the south side of this entrance, where it is nearly a mile wide. Thence the passage trends west 2 miles to abreast Serpent point on the south shore, the breadth being about half a mile, and the soundings 180 fathoms in the middle, 25 and 26 fathoms near the shores ; it then widens and trends W.S.W. 4 miles to abreast Twilight point (the south-west point of Denny island) with no bottom at 88 fathoms near the north shore, and 28, 12, and 20 fathoms close to the points extending from the south shore.

The entrance to Plumper channel, which is a mile wide, lies opposite Twilight point, from which Lama passage turns to the north-west for 4 miles to Grave point, which has several Indian graves on it ; from 2½ miles north of Twilight point to Grave point the passage is contracted to 2 cables, with uniform depths of 25 to 80 fathoms.

Cooper Inlet, situated on the southern shore of Lama passage, 5 miles from the eastern entrance, is deep and contains several small creeks and rocks ; but in fine weather anchorage may be obtained in 14 fathoms water under Westminster point, its north-west point, by bringing it to bear W.N.W., and Harbourmaster point, its north-east point, just open of the reefs off Charles point N.E. by E. ¼ E.

Jane creek, in the south-east corner of Cooper inlet, may be used by small vessels. Charles point, its north point, has two reefs extending one cable from it in a north-westerly direction, the outer of which dries 9 feet. Good anchorage may be had in this creek in 9 fathoms water, with Charles point in line with the east point of Canoe bight (on the opposite shore of the passage) bearing N.W. ¼ W., and George point, the south entrance point of Jane creek, S.W. by W. Large vessels may anchor in about 18 fathoms midway between Charles and George points ; the bottom in this creek is generally rocky.

Camp Point, at the south-west extremity of Denny island, and which is the turning point into Lama passage, should not be rounded nearer than half a mile, as the bottom is foul for a distance of 8 cables, with patches that uncover 2 feet at low water springs.

McLaughlin Bay,* on the west shore of Lama passage, half a mile south of Grave point, is a good stopping place ; it is about 4 cables wide and 1½ cables deep, with 8 to 14 fathoms water. The south point of the bay has a bare summit, 150 feet high, which in thick weather is a useful guide to a stranger. The anchorage is in 11 fathoms off the centre of the beach about a cable from the shore, with Grave point open east of south-west point of Narrows island bearing N. ¼ W., and Archibald point open east of Napier point S.E. by E.

In this bay is the site of an old Hudson Bay trading post, which in 1868 was again used as such, the Bella Bella natives simultaneously migrating here from the Bella Bella islands ; there is a small quantity of cleared ground at the foot of a rocky hill

* See Admiralty plan of McLaughlin bay on sheet No. 1901.

200 feet high, a quarter of a mile from the beach, on the west side of which there is a lake.*

Bella Bella Islands, bare and about 15 feet high, lie three-quarters of a mile north of Grave point; these islands were, until recently, inhabited during the summer months by the Indians of the formerly powerful Bella Bella tribes, numbering now however only (1867) about 45. Temporary anchorage may be had to the eastward of Bella Bella islands, off a green bushy flat, the old winter residence of the natives.

Klick-tso-alti Harbour, on the north side of Denny island, and $1\frac{1}{2}$ miles east of Bella Bella islands, is about half a mile in extent, with depths of 9 to 13 fathoms, and affords excellent shelter for vessels of any size. Harbour island, off the north-west point of Klick-tso-alti, has a reef extending one cable from its east end.

Steamer Passage.—The channel south of Harbour island is one cable wide, with a depth of 7 fathoms, and is suitable for small vessels; large vessels are recommended to pass north of Harbour island and through Wheelock pass, which lies between a 3-fathom patch near the centre of the channel and Noble point, the north-east entrance point of the harbour, off which a 3-fathom shoal extends three-quarters of a cable in a south-westerly direction.

The west extreme of Cypress island in line with the east extreme of Meadow island bearing N.N.W. $\frac{1}{2}$ W. leads through Wheelock pass in 11 to 19 fathoms water, and when Harbour island bears West a vessel may anchor in 12 fathoms.

If in a large vessel and not wishing to enter Klick-tso-alti harbour, secure anchorage may be obtained in 15 fathoms, with Harbour island bearing S.S.E. $\frac{1}{2}$ E. distant 8 cables.

Ka-Koosh-dish Creek, just north of Noble point, is suitable for small craft, but is barred across by kelp, having $8\frac{1}{2}$ fathoms.

Gunboat Passage, between Denny and Cunningham islands, is narrow and intricate, containing many rocks and kelp patches. From its western entrance it trends about E. by N. 6 miles, thence North 2 miles to its eastern entrance, which is at the junction of Fisher and Deane channels.

Gunboat passage should not be attempted unless in small handy coasting vessels, with good local knowledge.

SEAFORTH CHANNEL.—This is the main channel connecting Lama passage with Milbank sound; it is 14 miles long E. by N. and W. by S., with an average breadth of one mile; the land on both sides is much broken by islands with channels between leading north and south; the water is generally deep, and with the Admiralty charts there should be no difficulty in navigating, in ordinary weather.

Kyaumpt Harbour, on the south shore of Seaforth channel, and about 2 miles westward from its junction with Lama passage, may be recognised by Grassy islet, 20 feet high, and Regatta reefs, both of which are conspicuous, lying in the middle of the channel $1\frac{1}{2}$ miles eastward of the harbour, also by White stone, a conspicuous bare

* A rock is said, from Indian report, to exist in Lama passage abreast McLaughlin bay, and to lie half a cable from the eastern shore, with Napier point bearing S.S.E. distant nearly 6 cables; this reported danger may be avoided by keeping in mid-channel.—H.M.S. *Amethyst*, 1876.

rock 12 feet high, lying 2 cables west of Kynumpt. This harbour is 4 cables long N.N.W. and S.S.E., and averaging 2 cables in breadth, with 6 to 16 fathoms, mud; the best anchorage is in 7 to 9 fathoms with the north extreme of Berry point bearing East, and the west extreme of Low island N.N.E.

Tides.—It is high water, full and change, at Kynumpt, at 0h. 30m. Springs rise 14 feet, neaps 11 feet.

Observation spot, on Berry point, is in lat. $52^{\circ} 12' 20''$, long. $128^{\circ} 11' 37''$, considering Shell island, Beaver harbour, to be in $127^{\circ} 25' 7''$.

Dall Patch, with less than 6 feet water, lies half a mile N.N.E. from the entrance to Kynumpt harbour; from the centre of the patch Defeat point bears S. $\frac{1}{2}$ W., distant $8\frac{1}{2}$ cables; White stone S.W. by W.; and west extreme of Low island S. by W.; a shoal of 8 fathoms extends $1\frac{1}{2}$ cables to the westward of Dall patch.

To avoid Dall patch, it is recommended to keep the southern shore on board, which in this vicinity may be approached to within $1\frac{1}{2}$ cables. Or, if wishing to go northward of the patch:—Grassy islet, in line with the south extreme of Handyside island bearing E. $\frac{1}{4}$ N. leads nearly midway between Dall patch and Regatta reef.

Cod Bank, with 27 fathoms, sand, lies in the middle of the western entrance to Seaforth channel, N. by W. $1\frac{1}{2}$ miles from Sound point, the south-west entrance point to Seaforth channel; there are 58 fathoms on the south side and 163 fathoms, rock, close-to, on the north side of Cod bank.

Anchorage.—Between Sound point and Gale creek, at $2\frac{1}{2}$ miles to the eastward of it, a bank extends about three-quarters of a cable from the south shore of Seaforth channel; on its outer edge—which is steep-to—there are depths of 28 and 30 fathoms, decreasing to 18 and 10 fathoms close to the shore for a distance of one mile east of Sound point. Thence to Gale creek, reefs with 9 fathoms close-to extend about 3 cables from the shore. During foggy weather, temporary anchorage may, with careful use of the lead, be obtained on this bank.

The following directions as far as Port Simpson, are compiled from the *Coast Pilot of Alaska*, U.S. Coast Survey, 1869:—

MILBANK SOUND and FINLAYSON CHANNEL.—The entrance to this sound, in about lat. $52^{\circ} 13'$, lies between the Bardswell group of islands on the south and Price island on the north; it is about 8 miles wide and has a great depth of water. Its south-east point is cape Swaine, and its north-west point is point Day, off which lie several barren rocky islets. The southern side of the sound, being entirely covered with trees and having low shores, is very pleasant in appearance, but its northern shores are wild, consisting of low rugged cliffs, fronted by innumerable rocky islets and rocks.

A short distance within the sound, on its eastern side, is the entrance to Seaforth channel, described on page 869. Northward of Milbank sound the strait, taking the name of Finlayson channel, runs nearly North for 32 miles to Carter bay, with an average width of 2 miles. From the south entrance of the channel a peculiarly marked high pyramidal mountain is seen to the N.N.E. This mountain is 2020 feet high and is wooded nearly to its summit; it is named Striped mountain, on account of a great white streak down its south side, evidently the rock denuded of soil and trees. The land at the base of the mountain is flat, sparsely covered with herbage. It is the first untimbered space met with in going north through these channels.

In lat. $52^{\circ} 48'$ Finlayson channel divides; a narrow continuation runs N.N.E. and an arm, known as Ship passage, stretches E.N.E. to Mussel inlet.

Carter Bay.—Facing the south, with a channel to the north-west and another to the north-east, lies the opening of this bay, having a wooded mountain 2180 feet high on the west and another 2810 feet high on the east. Carter bay is one of the most convenient anchorages in these channels; it is about a mile deep by half a mile wide, gradually decreasing to the head where a flat has formed at the mouth of a small rapid stream. The best anchorage is in 15 fathoms, muddy bottom, about 300 yards from either shore, and 400 yards from the flat. From the anchorage, looking towards Finlayson channel, a splendid view presents itself; precipitous mountains overhang the vessel on either hand, and high mountains are seen in the distance on both sides of the channel.

Graham and Fraser Reaches.—North of Carter bay the main channel trends in a north-westerly direction for 34 miles to Kingcome point, where it makes a sharp turn to the westward. This channel averages about half a mile in width, with very precipitous shores, and a great depth of water. Five miles from the southern entrance of this narrow strait is a dangerous rock, known as Hewitt rock, lying in mid-channel and having only 10 feet water over it. To avoid this danger "keep the north shore aboard." In about latitude $53^{\circ} 5'$, on the western shore, is a cascade formed by a great body of water pouring over a rocky incline from a lake at the base of an immense circle of perpendicular mountains. In about latitude $53^{\circ} 12'$ there is an island in the middle of the strait, abreast which, on the east side, a deep bay opens and stretches 2 miles northward. Off point Kingcome, at the head of the strait, and to the westward of it, are soundings without bottom in 139 and 179 fathoms.

At point Kingcome one of the three great arms stretches northward 40 miles; about 8 miles from the point, on the east shore, there is anchorage at the mouth of Fisherman or Ribachy creek. From point Kingcome the main channel runs westward 9 miles, where great channels open to the north and south, but the direct route is through Grenville channel, the southern entrance of which lies N. 60° W. 8 miles from the north point of Horne bay.

Horne Bay (or Holmes bay) is one of the few anchorages in this vicinity, and is situated directly under the point 7 or 8 miles westward of point Kingcome; it is contracted, very deep, except at the head, where vessels anchor in 17 fathoms water, 200 yards from the beach. It is open to the north-west.

GRENVILLE CHANNEL.—From the south entrance, in lat. $53^{\circ} 21'$, this remarkably straight and narrow channel runs 45 miles in a north-westerly direction, separating the island of Pitt, on the west, from the mainland. The depth throughout the greater part ranges from 61 to 49 fathoms, over rocky bottom, and 70 fathoms over mud. The narrowest part of the strait is not more than 700 yards wide, and on account of the great height of the shores appears much less. The scenery is very wild and mountainous, some of the mountains rising to the height of 2000 to 3000 feet.

Lowe Inlet, on the east shore of the channel, 14 miles from the southern entrance, affords good anchorage in 18 fathoms water, half a mile inside the entrance. The approach to this inlet from the south is indicated by a bare hill, 400 feet high, on the western shore; it is situated 2 miles south-east of the entrance of the inlet.

Stewart Harbour, 5 miles from the northern entrance of *Grenville channel* and on the western shore, also affords anchorage in 10 fathoms water, on the north-west side of a point forming the eastern side of the harbour. Half a mile north-west of the extremity of this point are some dangerous sunken rocks. (*See Admiralty chart, No. 1901.*)

The northern end of *Grenville channel* expands to 8 miles in width, but the middle is occupied by a large group of comparatively low wooded islands, known as the *Gibson group*. The usual channel is to the westward of them, and when abreast them the wide passage to the sea, known as *Ogden channel*, opens to the south-west. North of *Gibson islands* the waters expand into large arms and sounds; the principal of these, *Chatham sound*, lying nearly north and south for 40 miles, connects the waters above described with those of *Dixon sound* and the straits of the *Alexander archipelago*. There are numerous rocky islets and shoals in *Chatham sound*, but their positions on the chart are considered doubtful. On the east side, in lat. $54^{\circ} 20'$, lies *Tugwell island*, connected with the mainland by a low sand spit, nearly 2 miles long east and west, and forming the bay of *Metlakatla* on the south, and *Duncan bay* on the north side. A thriving village is located here.

PORT SIMPSON.*—In the easternmost part of *Dixon sound*, where it meets the north part of *Chatham sound*, and 15 miles north of *Duncan bay*, lies the harbour known as *Port Simpson*; it is open to the west, but in a measure protected by a large reef and by *Birnie island*. The northern shores of this bay run north-west and south-east for nearly 4 miles, and the south shore lies nearly east and west, over 2 miles. On the north side of the south-west point is the usual anchorage, off the station of the *Hudson Bay Company*, and the large village of the *Chim-shyans*. Two miles westward of *Port Simpson* lies the north end of the moderately high wooded island named *Finlayson*, from which the south end of the wooded island, named *Birnie*, is distant $1\frac{1}{4}$ miles in a northerly direction. Two passages lead to the port; one, the southern, lies between the east shore of *Finlayson island* and the main; it is 3 miles long and half a mile wide in the narrowest part, with a very narrow passage through the reef. Another, the northern and safer passage, lies between *Birnie island* and the northern side of *Harbour reef*; this channel is half a mile wide, has 17 to 24 fathoms water, and is known as *Inskip passage*. Vessels should pass within a quarter of a mile of the south rocky point of *Birnie island*, steering E.S.E. one mile, or until the easternmost Indian houses bear S.S.E., and run for them until the stockade bears S. $\frac{3}{4}$ W. about 8 cables distant, when anchor in 10 or 11 fathoms. Vessels approaching the port by the northern passage must be careful to avoid an extensive reef, named the *Pointers*, lying 3 miles westward of *Birnie island*.

Tides.—It is high water, full and change, at 12h. 35m.; springs rise $21\frac{1}{4}$ feet, and neaps $14\frac{1}{4}$ feet.

Fort Simpson is a stockaded post of the *Hudson Bay Company*, and the most important in this part of the country. It consists of a square timbered palisade, with

* *See Admiralty plan of Port Simpson, No. 2436.*

a front of 200 feet and depth of 160 feet having wooden bastions at the north-west and south-west angles. It is entered by a large gate opposite the beach and has one or two smaller doors at the rear, leading to the gardens. Within this stockade are large wooden buildings for the traders, &c.; the great building on the west side is for the reception of furs until ready for shipment.

The habitations for the Indians number about 100 and are generally built of wood, 30 to 40 feet wide, 60 feet long, and 15 to 20 feet high. Before most of these houses there is a tall thick post, carved with grotesque figures. When all the tribes are assembled they number about 2000; very few are hunters, most of them being inter-traders.

The approximate geographical position of fort Simpson is lat. $54^{\circ} 33' 35''$, long. $130^{\circ} 22' 49''$ (U.S. Coast Survey).

DIXON SOUND.—This sheet of water, opening upon the Pacific Ocean, lies between the north side of the Queen Charlotte group and the south capes and shores of the Alexander archipelago, between latitudes $54^{\circ} 10'$ and $54^{\circ} 35'$, and longitudes 131° and $133^{\circ} 30'$. On the northern part are the entrances of several extensive straits and sounds; at the north-eastern part is the channel leading to Portland canal, the southern dividing line between British Columbia and Alaska.

Dixon sound is comparatively free from dangers, having, however, a few rocks on the north side, the positions of which as laid down on the chart are considered doubtful.

QUEEN CHARLOTTE ISLANDS.

Magnetic Variation in 1880:— 26° to 27° E. It is estimated to increase about 3 minutes annually.

These islands although among the British Possessions are but little known, and the few shipmasters who have visited them have scarcely increased our acquaintance with them. The following instructions are almost entirely from a hydrographic notice by Mr. George H. Inskip, R.N., of H.M. steamer *Virago*, 1853. The remarks on the physical geography of the islands are chiefly compiled from an article on the subject by Mr. Robert Brown, F.R.G.S., 1870.*

GENERAL REMARKS.—The Queen Charlotte islands, so named in 1787 from the vessel commanded by Captain Dixon, one of the earlier explorers of the group, extend 160 miles in a N.N.W. and S.S.E. direction. The greatest breadth of the group at the northern extremity, is about 60 miles, whence it gradually diminishes to cape St. James, the southern extremity, where it terminates in a point,—giving the whole chain of

* Reference should be made to the Admiralty charts Nos. 2430 and 2168.

See also the interesting remarks upon the islands by Mr. Inskip in the *Nautical Magazine*, 1855, and those by the officers of H.M.S. *Virago*, in the *Nautical Magazine*, 1854.

islands a wedge shape form. The group, consisting of three principal islands and several smaller ones, is situated approximately between latitudes $51^{\circ} 54'$ and $54^{\circ} 21'$, longitudes 181° and $188^{\circ} 5'$, and at distances, varying from 20 to 80 miles according to the trend of the coast, from the nearest islands lying immediately off the mainland. It is only on very clear days, and at the narrowest portion of the strait that Queen Charlotte islands can be seen from the mainland or *vice versa*, and then only as a hazy outline.

The channels separating the larger islands are named Houston Stewart, and Skidegate; the former channel runs between Prevost and Moresby islands, and the latter between Moresby and Graham islands.

The western shores of all the islands are much more rugged and precipitous than the eastern, and the southern islands are much lower than the more northern ones. Moresby island is said to be high and mountainous in the interior, but having a long stretch of flat land skirting its eastern coast.

The interior of the Queen Charlotte islands has not yet been explored, but it is believed to be very mountainous, and thickly covered with forest trees and undergrowth. In fact, the whole country in this region of the North Pacific is densely wooded, rendering the operations of exploring parties both difficult and arduous. The absence of large game in these islands also adds to the difficulty of exploring them. From certain localities the Indians are in the habit of passing through the islands, but they do not appear to be much acquainted with the greater part of the interior.

The Natives.—The only people permanently inhabiting the islands are the Indians, generally known by the name of *Hydahs*; they are one people, speaking the same language, and having a similar appearance, but they are divided into several tribes under different names. Physically, they are perhaps the finest race on the North American continent; as warriors they are very bold, and they are said to be cruel and vindictive in the extreme.

It is reported that they hold slaves, and frequently treat them very cruelly. They are fond of travelling, and make voyages of several hundred miles in their canoes, visiting Sitka to the north, and Victoria harbour (Vancouver) to the south.

Some of the woman are very good looking, though often full in the face. They have, however, a most hideous custom of disfiguring the lower lip by inserting through it a bone ornament, concave externally and internally, which has the effect of causing the lip to protrude in a shelf-like form. Of late years, however, the young ones have been giving this practice up, finding that it is not agreeable to their Caucasian admirers. The men and woman are tall, muscular, and erect. The face is full, with well-formed head, not in any way disfigured or compressed, as in the more southern tribes. Their hands and feet are small, and well-formed. Their colour is very fair, and in the women, who are not much exposed to the weather, there is a mixture of red and white in their cheeks, not seen in any other aboriginal American race. Their eyes are horizontal, eyebrows rather sloping upwards, and not bushy. Tatooing on the back of the hands and arms, often into fanciful resemblance to the human features, is occasionally seen, and sometimes, as in the women, a few slight streaks (in blue) on the cheeks; but this is not universal. The women have their wrists, and sometimes their ankles, profusely ornamented with bracelets of native manufacture, made out of

silver coin, obtained from the traders who visit them. They also wear ear-rings and rings of the same metal; and often these pieces of jewelry display wonderful skill and taste in the workmanship.

The Hydahs are divided into seven tribes:—1. The *Skidegates*, claiming the whole of the Sound of the same name, and the greater portion of the outside coast of Graham's island, and down to Gumschaw harbour. 2. The *Laskeeks*; these claim the sound, and divide the rest of the east coast not appropriated by the *Skidegates* between themselves and the next tribe. 3. *Clews*, about the southern portion of Moresby island. 4. *Kung-at-adi*, on St. Anthony's island, and near cape St. James. They claim all the country up to near Tasso harbour. There are no Indians here, but the (5) *Skitons*, or Gold harbour Indians, claim all the coast up to cape Knox. The northern end of Graham's island is claimed by the (6) *Massets*. Masset harbour runs for about 20 miles in a southerly direction, with a large and beautiful river flowing in at the head. There are two Indian villages on the right-hand side of the harbour, and one on the left. The tribe is the largest and most powerful in the island. The *Massets* travel south to *Skidegates* village overland, keeping, for a short distance, by the sea, and take, according to the state of the trail and place where they strike into the interior, from one and a half to three, and even seven days. The *Skidegates* also travel by this way, and their journeys are generally taken in winter, when they are afraid to venture on the outside with their canoes. They are, however, very skilful and courageous men; they cross over from the islands to the mainland in large war-canoes. In Virago sound are also several Indian villages. Stanelys river here empties into the sea. It is said to flow out of a large lake in the interior, in which the river at Masset harbour also takes its rise. On this lake the Indians declare there is a powerful tribe, who would slay the coast Indians if they ventured there. 7. The *Gumchaws* claim the harbour of the same name, and the adjoining territory.

The total population of these tribes has been variously stated, but in all probability they do not now exceed 5000, though formerly they numbered more, being estimated at 8000 to 10,000 in 1839.

Minerals, &c.—The general structure of these islands appears to be beds of conglomerate, slate, coal, and sandstone, resting upon erupted greenstone, the whole being much contorted and altered by the agency of heat.

The coal found in *Skidegate* bay has all the character of anthracite, but is metamorphosed by the presence of igneous rock. Some portions of the seam are soft, like gunpowder; while scattered here and there through this are seams of hard anthracite. This coal is said to be almost as good as Pennsylvania anthracite for smelting purposes, its heat-giving properties being immense. In the neighbourhood of Masset harbour a coal, resembling cannel coal, has been observed. Copper (chiefly in sulphates and carbonates) has been found at several places on the island, and at Gumshaw harbour; on Moresby island, a company was engaged for some time in working the ore. On some of the northern parts of the island copper has also been found, and one specimen gave an analysis 96 lbs. to the ton—value about £1400 the ton. Half-way between Tasso harbour and Awee the Indians say there is plenty of copper. Gold has been found in quartz veins on the island in considerable quantities. As far back as 1850 or 1849 the Indians were in the habit of bringing rough gold to Port Simpson, on the

mainland, opposite Queen Charlotte islands. This gold they obtained from a locality on the west of the island, now called Gold harbour. The Indians lit fires over the vein, then dashed water over it when hot to disintegrate the quartz, and with the aid of tomahawks grubbed out the pieces, which they sold. To this day Indians bring pieces of gold to Victoria, and a periodical semi-excitement ensues over them. The vein as originally found (in Mitchell harbour, an anchorage of Gold harbour) was 7 inches wide, was traced for 80 feet and contained 25 per cent of gold in many places. The heaviest specimen of pure gold yet obtained from this locality weighed 14 to 16 ounces.

Among other economic minerals *steatite* has been found on the shores of Skidegate channel. Boiling springs are said to be found at *Clew*, on the southernmost island. These hot springs are found at different places in British Columbia, and many in southern Oregon; sometimes a boiling and an icy cold one are within two or three yards of each other. There are no volcanoes, either active or extinct, in these islands.

Vegetation, &c.—The whole of the islands with the exception of some insignificant patches of open land, are wooded down to the water's edge, the sea in many places washing the very roots of the trees. This forest consists of the ordinary coniferæ and deciduous trees common to the North Pacific. Menzies spruce is the most common tree; and in some places attains gigantic proportions. The undergrowth is mainly "salal" which, in this wet climate, attains much greater luxuriance than further south. No sort of cultivated plant is grown by the natives except potatoes, which are produced in more considerable quantities than by any tribe or race of Indians, and in very excellent quality.

Zoology, &c.—Most of the wild animals of the North Pacific are found on these islands or frequenting the sea, laving their shores. A remarkable exception is, however, any species of deer or wolf, a natural sequence, though both are most abundant on the mainland immediately adjoining. The beaver is reported to be found. Bears and sea otters abound, and on the west coast and on Prevost island are many large fur seals. Only one species of salmon visits the islands, which is said to arrive in May. Accordingly, most of their supplies of salmon are bought from the Tsempsheans and other tribes on the mainland. Sea-fish are abundant enough. Halibut are caught in great quantities on the west coast of Graham's island, and hither the Indians resort every year to catch, split, and dry them for winter use. Immense flocks of wild geese and duck at times visit the islands. Potatoes, fish and other products are all to be bought either for money, strong cotton shirts, cotton dresses, plain cotton, knives, tobacco, mother of pearl jacket buttons for ornamenting their blankets, or any of the articles commonly bartered among savages.

The bears, martens, sea and land otters are caught for their furs, which are taken to the Hudson Bay Co.'s establishment at fort Simpson (port Machlochlin), or to Rupert fort (Beaver harbour) in Vancouver island.

Climate, &c.—Though situated so far north, the climate of the Queen Charlotte islands, from their insular position, is much milder than that of the mainland. Some men who wintered upon them described the temperature as being moderate, little snow and a great deal of rain. Indeed, all north of Fraser river the climate is very moist. At

Sitka it rains almost continuously, the average rainfall amounting to nearly 89 inches per annum. The tides, as all over the north-west coast, where there are so many inlets and circuitous bays, coves, and sounds, are very irregular, and little dependence can be placed on them. At Skidegate harbour, on the 17th of April, 1866, the rise and fall of the tide was found to be $27\frac{7}{10}$ feet.

CAPE ST. JAMES, so named by Mr. Dixon from the saint's day upon which it was first seen, is the southern extremity of Prevost island; its approximate geographical position is lat. $51^{\circ} 54'$, long. $181^{\circ} 2'$. The land about it has very moderate elevation; but, similar to that in the northern part of the islands, it rises gradually to the rugged and uneven mountains, which occupy the centre of the group. When approaching the islands from southward, it is the high land behind the cape that will be first seen. The cape is formed by several islets and rocks, and until the sea in its vicinity is examined, must be approached with extreme caution, for it is said that a sunken ledge extends from it 8 to 5 miles between the directions of S.S.E. and S.E., the edges of which are probably steep.* With the cape bearing W. by S. $\frac{1}{2}$ S. about $8\frac{1}{2}$ miles, and the outermost rock above water S.W. $\frac{1}{2}$ S., a cast of 90 fathoms have been obtained.

HOUSTON STEWART CHANNEL.—From cape St. James the eastern coast of Prevost island is much broken, with one round thickly wooded and conspicuous island and several little islets and rocks along it, and trends nearly N.W. to a well defined headland, which after rounding the eastern entrance to Houston Stewart channel and Rose harbour will open out. At about 4 miles from the entrance there are 90 fathoms water, and the depth gradually shoals to 20 fathoms to within a mile of it; from this distance off, the soundings are very irregular, varying from 80 to 7 fathoms, over a series of ridges or bars of rock, sand, shell, and mud.

Entering from Eastward.—In the eastern entrance to this channel, which is about three-quarters of a mile wide, there are 20 fathoms water. Within Forsyth point, on the north side of the entrance, is a snug bay, bordered by a sandy beach, in which, at nearly three-quarters of a mile from Forsyth point, and at a third of a mile from the beach, is a very secure and convenient anchorage in 16 fathoms.

At a quarter of a mile inside Forsyth point, and a little to the northward of the line of direction of the channel, is a rocky patch with kelp, having only one fathom on it a vessel therefore should not haul to the northward too soon after entering. On the southern side of the channel are some small wooded islands, here and there fringed with outlying patches of kelp, which latter should always be avoided. W.S.W. $1\frac{1}{2}$ miles from Forsyth point is the Trevan rock, lying nearly mid-channel, and contracting the passage on its northern side to rather less than half a mile; patches of kelp and the largest of the islands before mentioned render the other side impassable, excepting for boats; close to the north side of this rock the depth is 7 fathoms. At a mile farther in, the channel branches off both to the northward and southward.

Entering from Westward.—The southern arm of Houston Stewart channel is about

* Mr. Gray of the *Columbia* informed Vancouver that he had struck and received material damage upon a sunken rock at a much greater distance from the cape than a league, though in the same direction as that mentioned, between S.S.E. and S.E.

8 miles long, and three-quarters of a mile wide, with several small islands at its southern end or entrance from the Pacific. The shores of both sides are bold and densely wooded. A vessel coming from the southward and wishing to go in by this entrance, when abreast cape St. James, should close the land to $1\frac{1}{2}$ miles, and after coasting it for about 12 miles, the entrance will open out. After passing a convenient distance southward of the largest and outer island at the entrance, named Anthony island (off the southern end of which an extensive ledge of rocks projects in a south-west direction), the channel will show itself; the other islands are all wooded; a bare flat rock which lies much nearer the western than the eastern side, and which should be kept on the port hand, will be a good guide. There is an Indian village of the Shangoi tribe on St. Anthony island; the natives are very wild, and persons visiting or trading with them should be on their guard.

Rose Harbour.—This secure and capacious harbour forms the northern arm of Houston Stewart channel. It runs up in a northerly direction for 8 miles from its junction with the channel, and is a continuation in nearly a straight line with the last-mentioned portion of it. For the first 2 miles the average breadth of the harbour is three-quarters of a mile; the western shore rises boldly with deep water close to; the eastern shore although high, has kelp along it, with shoal water. The harbour then contracts to half a mile, between two low points forming its head. Beyond these points is a basin, about 2 miles in circumference, filled with rocks and woody islets; the land on its north and west sides is high and mountainous, whilst that on its eastern side is low.

The country around this locality is mountainous, and thickly wooded; but the timber is smaller and less valuable than that in the magnificent forests of Vancouver island. The soil is poor, but there are indications of copper in different places. The sea otter, the fur of which fetches very high prices in China, are numerous.

The Coast.—About 8 miles northward of the eastern entrance to Houston Stewart channel, and at about 2 miles off the coast, is a ledge of rocks, lying a little above water; the sea breaks violently over them, and for a considerable distance around;—other rocks encircle these, but they are under water. From Houston Stewart channel to Cumshewas harbour, on the eastern side of Moresby island, a distance of about 50 miles, the coast is high, and broken into numerous inlets, with many islets along it, probably affording good harbours. Cumshewas harbour is in *about* lat. 58° .

Cumshewas Harbour trends nearly E.S.E. and W.N.W., and is reported to be both large and safe. A spit, on which the sea breaks heavily, runs off its southern point of entrance nearly two-thirds of the way across to the northern side. The channel in is over a bar with 8 fathoms water on it: this bar connects the end of the spit with the northern shore, inside the north point of entrance, and off which lies a small island.

SKIDEGATE HARBOUR and CHANNEL.—About 20 miles north-westward of Cumshewas harbour is the entrance to Skidegate harbour and channel. The intermediate coast is lower and more level than that to the southward, with an extensive bank along it for some miles before coming to Skidegate, the depth being as little as 7 fathoms, at 8 to 4 miles off shore.

Skidegate harbour is very spacious, and communicates with the Pacific at Cart-

wright sound, near Buck point; the channel, however, is intricate, and only navigable for canoes a portion of the way through. The southern point of the eastern entrance is low and woody, and a spit, with only from one to 2 fathoms on it at low water, extends in a N.W. direction for about 4 miles, to within one mile of Dead Tree point, which is the northern point of entrance, and receives its name from the number of dead trees upon it. A rock, just awash at low water springs, lies near the outer extreme of the spit, about one mile from this point, but the available passage between is not more than half a mile wide, as the spit extends beyond the rock, and the shore near the point is not bold.

Directions.—When bound into Skidegate harbour, first get well to the northward of its entrance, and run along the shore keeping about half a mile distant from it, in about 7 to 8 fathoms water, and paying strict attention to the soundings, until Dead Tree point bears W.N.W., when the water will deepen to 15 fathoms; then steer more to the eastward, and the water will shoal again, and if the weather is clear, a remarkable promontory (looking like an island) will be seen at the head of the harbour, also the two village islands, unless it be very thick, can always be recognised.

Keep the promontory just touching the eastern side of the village islands (when in one), bearing South, and it will lead in over the bar in 5 fathoms; after passing the bar, the water will deepen to 15 or 16 fathoms, and the village islands can be passed on either side. If the inside passage (which is about a quarter of a mile wide) is used, keep in mid-channel, and follow the shore for about 2 miles, round two small points to the anchorage, which is in a capacious and pleasant looking bay, in 13 fathoms water, over muddy bottom, at one-third of a mile from the beach; the surrounding land is moderately high and thickly wooded.

The village of Skidegate is situated in the bay, off which are the village islands, and consists of many houses fronting the beach, all of which are dirty and smell strongly of fish. The Indians are a finer race than the Vancouver islanders, and although very dirty, are much cleaner in their personal appearance. A space of ground near the village is cleared of brushwood for potatoes, which thrive exceedingly well. Plenty of wood and water can be obtained, and the natives will gladly assist if paid with tobacco, &c. for their labour. Some distance from the anchorage, and on the side of a mountain, are large quantities of coal, of a description very similar to that discovered at Nanaimo in Vancouver island; it is, however, in too inconvenient a position to be worked.

The Coast.—The coast between Skidegate and Rose point, the north-east extreme of Graham island, being rather low, with dangerous flats running off it, should be given a berth of at least 6 or 7 miles, and the lead kept constantly going whilst running along it; the soundings were from 9 to 11 fathoms. Cape Ball, nearly 20 miles from Skidegate bar, is very conspicuous, having a remarkable white cliff on it, with lower cliffs on either side; it cannot be mistaken, for there is no land like it between Skidegate and Rose point. Captain McNeil, of the Hudson Bay Company's service, found a rock with only 2 fathoms on it lying East about 6 miles from cape Ball.

Rose point is low, and has a dangerous spit running off it in a N.E. direction for nearly 5 miles. With the point bearing W.S.W. about 6 miles, a round shaped hill,

named Macroon, will open out clear of the land off which this spit runs; the hill is about 300 or 400 feet high, but shows out so distinctly as to look almost an island. This part of Dixon channel, between the land near Rose spit and Stephens island on the continental side, is about 20 miles wide, with soundings quite across. When the centre of Zayas island bore N. by W. $\frac{1}{2}$ W., and the north extreme of Stephens island E. by N. $\frac{1}{2}$ N., which is about half-way between Rose spit and Brown passage, the depth was 15 fathoms.

The bank of soundings between Rose point and Stephens island was found very useful on one occasion, during a strong breeze from the S.E., with thick weather, when the *Virago* anchored on it and remained until it cleared up, and the land became visible.

The coast from Rose point to Virago sound is low, and thickly wooded for some miles from the shore, which has a bank running off it, and should be approached with caution, with the lead constantly going. At 8 miles N.N.E. $\frac{1}{2}$ E. from the east point of Virago sound, the depth was 52 fathoms over sand (there are soundings outside this for several miles); at 5 miles off, the soundings were about the same; at 2 miles there were 28 fathoms, sand, and the water then gradually shoaled in to the shore. From Virago sound to North island, the coast is tolerably bold, excepting in one or two places, where there are some rocks, but they do not extend far off, and are above water.

MASSSET HARBOUR.—Rather more than 20 miles S.W. $\frac{1}{2}$ S. from Rose point is Masset harbour, the entrance to which is formed between a low point, with a ledge of rocks half a mile off it covered with kelp, on the western side, and the point of a long spit partly dry (the surf usually breaking the whole length of it), on the eastern, the passage between having an extensive bar. With the outer western point bearing W. by N., one mile, the depth is 5 fathoms at low water; from this position the course in is about S. by E. $\frac{1}{2}$ E., the soundings over the bar varying from 3 to 5 fathoms, for about 3 miles, to abreast a village on the western shore, a little more than a mile from what may be termed the inner or proper entrance to the harbour; the water then suddenly deepens to 9 and 11 fathoms, the channel lying in the direction of the eastern point of what has been called the inner entrance, and the depth, at about 2 cables from the beach that forms it, being from 10 to 13 fathoms. Just inside, and round this point, is a pretty bay, with a beach, containing the principal village, off the centre of which there is anchorage in 10 fathoms. The ebb tide runs very strong, making this by no means a good anchorage.

At this part the width of the harbour is nearly 2 miles, a large sand bank filling up its western side. The natives describe the harbour as running in a southerly direction for many miles, and widening out considerably, with deep water, and that several years ago, ships (some having three masts) used to anchor in it.

In 1852 the Indians belonging to this place seized, plundered, and burnt an American schooner, the master and crew being spared through the influence of the chief; this should place any one who may happen to visit these people on their guard.

VIRAGO SOUND.—Between Masset harbour and Virago sound, which lies about 10 miles to the westward, there is good anchorage in some places, in which a vessel

might remain a night instead of keeping under-way, or cruising about with a S.E. wind, and thick weather.

The outer anchorage of Virago sound is sheltered from all winds to the southward of East and West. With two small wooded islets on the west side of the entrance, bearing W. $\frac{1}{2}$ S. 1 mile, the east point N.E. $\frac{3}{4}$ E. 2 miles, and the opening to the inner harbour South about 2 miles, the depth is 7 fathoms water, over sand and shells; the shores are low and fringed with kelp, but the lead will be a safe guide, as the water shoals gradually towards the land.

The inner harbour of Virago sound (the native name of which is Naden,) is capacious, and sheltered from every wind. For about one mile outside the entrance there are several banks, formed probably by the sand, &c., washed down by the ebb stream, which runs with considerable strength. The rise and fall of the tide is about 18 feet. The narrowest part of the entrance is about half a mile wide, with a deep water channel, which for the first 2 miles is intricate and should not be attempted until properly sounded. The western side of one part of the channel, which may be called the narrows, is completely blocked up by rocks, which show towards low water; within these the channel is much clearer, and runs up in a southerly direction for 2 miles farther, and then widens out into an extensive and magnificent harbour, several miles in circumference, having, it is believed, sufficient water for any vessel. Two streams, navigable for boats, empty themselves at the head of the harbour, and some smaller ones exist in other parts of it.

The village is to be built inside a point on the western side the narrowest part of entrance. Some ground near it is cleared for potatoes, which are much used by the natives, and form one of their principal articles of food.

PARRY PASSAGE, named after the late Sir E. Parry, separates North island (which forms the north-western extremity of the Queen Charlotte islands,) from Graham island. Rocky ledges run off its southern side for about a mile, but there is a good and clear channel between them and North island. The tidal streams rush through the passage, and form a perfect race. On the south side of the passage is, or was, a village.

Just without the eastern entrance of Parry passage, and on the south side, is a bay with anchorage in it. A line of kelp fringes the shore, which is studded with rocky patches and stones. This is not a good anchorage, as the flood sets into it from the passage, forming a number of eddies, and rendering it almost impossible to lie at single anchor without fouling it. The country at the back is low and covered with trees, with here and there grassy spots.

On the south side of North island, in Parry passage, is a snug cove named Henslung, in which whalers occasionally anchor. The *Virago* anchored in it in 80 fathoms water, and had but just room to swing clear of the precipitous rocks which form its western side. At the head of the cove is a sandy beach, with a stream of water running through it. The whole island is thickly wooded.

On the eastern side of North island there is said to be a good anchorage in a bay which was formerly often used by the vessels belonging to the old North West company.

Directions.—When leaving the western entrance to Parry passage, get a good offing

before hauling to the southward, as a rocky ledge runs off cape Knox for about 3 miles in a westerly direction, the sea breaking with great violence on several parts of it. When well out, Frederick point will show like a low projecting point of an island, (which it is,) about 18 miles to the southward. At 2 or 3 miles southward of Parry passage is an indentation of the shore, which might be taken as its entrance by a vessel coming from southward,—a mistake that might lead to serious consequences, as the whole coast, as far as Frederick point, appears to contain several open bays, with outlying rocks off each of them. The Indians, in their sketches of this part of the coast, do not draw any harbours, but merely exposed bays.

HIPPA Island, lying 25 miles southward of Frederick point, is high and bold to seaward. This portion of the coast is higher and more broken than the former, the openings appearing deeper, neither does it seem to have so many rocks lying off it. The Indians show some good harbours towards Hippi. When abreast Hippi island, Buck point, 80 miles distant, and also cape Henry. 10 or 12 miles farther to the southward, can be seen, the coast presenting the same high and broken appearance as the preceding 25 miles. All the points along this part much resemble Buck point, which is rather low and rugged, jutting out from the high land at the back.

Buck Point is on the southern side of Skidegate channel, which leads through to Skidegate. It has a large high island just northward of it, and there is another, much smaller and peaked, standing out clear of the land, at about 3 or 4 miles farther northward, and lying in the entrance of Cartwright sound, which is formed between Buck on the south, and Hunter point on the north. Just southward of Buck point, in Englefield bay, is an opening, probably leading into a harbour.

INSKIP CHANNEL.—Englefield bay has Buck point on the north, and cape Henry on the south, with Kuper or Kennedy island in its southern part. This island has a channel on either side leading into Mitchell harbour, known also as Gold harbour. The northern, or Inskip channel, which leads round the north side of Kuper island, was first used by the *Virago* in 1858, its entrance being a few miles south of Buck point. It is about $8\frac{1}{2}$ miles long, and half a mile wide. A little without it, there are some small islands on either side, but there will be no difficulty in discovering the passage in. In the channel there was no bottom at 60 fathoms, but at the entrance a cast of 35 fathoms was obtained on a halibut bank. At a short distance inside the islands, on the port side of the entrance, is a village belonging to the Kilkite tribe. Farther in, on the same side, and about $3\frac{1}{2}$ miles up, is a deep opening, and where this and Moore channel meet are two other openings to harbours, with some small islands lying near them. This channel is no doubt equally as safe as the other.

MOORE CHANNEL, on the south side of Kuper island, is named after Mr. Moore, late Master of H.M.S. *Thetis*. This officer made a survey of both it and, Mitchell harbour whilst in that ship, which was sent to protect British interests in 1852, during the time that a large number of adventurers from California had collected here to dig and search for gold, some of that metal having been discovered by the Indians. This channel is 5 miles long in an E.N.E. and W.S.W. direction, and half a mile wide, the shore on each side being bold of approach, high, and covered with trees nearly down to the water's edge. In mid-channel there is no bottom at 70

fathoms. On the north side, just without the entrance, are some small rocky islets, named Moresby islands, and on the south side a few rocks close in shore.

Mitchell or Gold Harbour, about $2\frac{1}{2}$ miles deep and half a mile wide, is surrounded by precipitous and densely wooded hills, from 700 to 800 feet in height, and at its head in Thetis cove is a sandy beach and a stream of water. At $1\frac{1}{4}$ miles up the harbour is Sansum island, a small spot covered with trees, and the ruins of a number of huts. The anchorage lies inside this, in Thetis cove, keeping Sansum island on the port hand; the passage being a cable wide with deep water. This cove is completely land-locked, but squalls, frequently accompanied by rain, come over the hills with considerable violence. At a good half mile from the mouth of the harbour, on the starboard side going in, is the Thorn rock, with only 3 feet on it at low water; it lies about a cable from the shore, and on the opposite side not quite at so great a distance from the land, but a little farther out, is another rock. These are dangerous to vessels working in or out; but there is nothing to fear if the wind be fair, and the ship kept mid-channel.

Douglas Harbour.—At one mile to the westward of Mitchell harbour, and on the same side of Moore channel, is the entrance to Douglas harbour, apparently very similar to the former, from which it is separated by Josling peninsula.

Directions.—The land being very high on both sides of the channels leading into the above harbours, influences the direction of the wind, which is either right in or out. Winds with any westing blow in, and those with easting the contrary. A sailing vessel leaving Moore channel with a S.E. wind should keep well over towards Hewlett bay, to enable her to fetch clear of the Moresby islands, as the wind will be very unsteady until well clear of the high land to windward.

TASSO HARBOUR.—Cape Henry lies 3 miles southward from the entrance to Moore channel, and terminates in a steep slope with a hummock at the extremity; 18 miles southward of this is the entrance to Tasso harbour, the intermediate coast being high, and rising abruptly from the sea. The entrance is short and narrow, but the harbour itself is extensive, with deep water in many places; the anchorage in it is near some small islands on the port hand going in; it has only been visited by a few of the Hudson Bay Co's. officers.

The Coast.—Between Tasso harbour and cape St. James are other openings, which, according to Indian report, lead into good harbours, the southernmost of which is that leading into Houston Stewart channel and Rose harbour. Inside Anthony island, and close to Houston Stewart channel, is an opening, called by the natives Louscoone, and reported to be a good harbour, not unlike Rose harbour. This coast is also apparently very bold, excepting off Anthony island, and like the previous 18 miles. The land near cape St. James has fewer trees on it than that to the northward.

Winds.—S.E. winds are prevalent, and are almost invariably accompanied with thick rain; those from the opposite quarter generally bring fine weather. The weather is very uncertain, and cannot be depended on for 24 hours at a time.

Tides.—The following brief account of the tides along the north and north-east coasts of the Queen Charlotte islands is given by a Hudson Bay Company's officer.

The course and rate of the tide streams are not regular, being greatly influenced by

the winds. At full and change they run with great strength. Time of high water, about 12h. 30m.

The flood, coming from the westward round North island, sets along the Masset shore for Brown passage, spreading about 15 miles round Rose point, towards cape Ibbetson, where it meet. the flood from the southward, from Skidegate, Banks island, and the Principe channel; consequently between Rose point, cape Ball, cape Ibbetson, and thence S.E. 4 or 5 leagues, the tides are very irregular.

The tides between cape Murray, Percy point, and Zavas island are the strongest and most irregular, causing a heavy and confused sea, so much so, that in bad weather it has the appearance of breakers.

Geographical Positions.—The geographical positions of the principal points and headlands of the islands as given in all charts at present existing, should be considered as only approximate to the truth. There has not as yet been even a running survey of the group. The following determinations are from observations made by an officer in the Hudson Bay Co. service.

Cape St. James	... ..	lat. 51	57	long. 180	52
Cumshewas island (north-east point)	... ..	58	1	181	22
Skidegate harbour	... ..	58	17	181	51
„ „ Bar rock	... ..	58	22	181	39
Cape Ball	... ..	58	42	181	36
Rose spit point	... ..	54	18	181	22
„ „ point of reef	... ..	54	15	181	11
North island (north point)	... ..	54	21	188	0
Devils ridge	... ..	54	40	181	28

Rose spit to Masset harbour S.W. $\frac{1}{4}$ S. 20 miles.

„ to Cumshewas S.S.E. 70 miles.

„ to Skidegate S. by E. $\frac{1}{4}$ E. 50 miles.

TERRITORY OF ALASKA.

Magnetic Variation in 1880 :—Sitka Sound, 30° E.

GENERAL REMARKS.—The whole of the American coast, north of latitude 54° 40', formerly known as Russian America, now belongs to the United States, and is denominated the territory of Alaska.

History, &c.—The colonization of this extensive territory was originally undertaken by the Russian-American Company, which was established under charter from the Emperor Paul in the year 1799; it was granted to them to occupy and bring under the dominion of Russia. The Russian company thus formed ultimately came into collision with the Hudson Bay Company, which had been established in the north-west territories of British North America ever since the year 1670.

In 1825, however, the boundary between the Russian and English possessions was fixed by treaty. The line commences in latitude $54^{\circ} 40' N.$, between longitudes 181° and $183^{\circ} W.$; it runs northward along the Portland canal as far as the parallel of $58^{\circ} N.$; then north-westward along the summits of the mountains, parallel with the coast, to the meridian of $141^{\circ} W.$, always provided that this line shall not exceed the distance of 90 miles from the coast.

In 1834 an expedition was fitted out at considerable expense by the Hudson Bay Company, to endeavour to establish trading ports on the great river Stikine; this procedure, however, was resented by the Russian-American Company. The Russians established a blockhouse at the mouth of the river, and sent a corvette to prevent the designs of the English Company being carried out, although the latter claimed the privilege of navigating the rivers flowing from the interior of the continent to the Pacific, across the boundary-line established under the treaty of 1825. The British Government demanded redress for this infraction of the treaty; and, after negotiations between the two governments and the two chartered companies, it was agreed, in 1839, that from the 1st of June, 1840, the Hudson Bay Company should enjoy for ten years the exclusive use of the continent assigned to Russia in 1825, and extending from lat. $54^{\circ} 40'$ to cape Spencer, near long. 58° , in consideration of the annual payment of 2000 otter skins to the Russian-American Company.

The charter of the Russian-American Company, granted in 1799, was renewed in 1839, when they had thirty-six hunting and fishing establishments. Sitka, or New Archangel, founded in 1805, was their chief post, and here all the business of the company centred.

The extensive but comparatively useless region, known as the territory of Alaska, was purchased from the Russian Government by the United States, for the sum of 7,200,000 dollars, in coin, the treaty for the transfer being signed on May 28th, 1867. The sum of 200,000 dollars was added to the amount for the purpose of extinguishing the claims of the Russian-American Company, whose head-quarters were at Sitka, and of an ice company established in Kodiak, who had special privileges conceded to them.

The population of the territory at the time it was ceded to the United States, was estimated to be about 2000 whites, and 60,000 creoles and Indians.

Physical Geography.—The coast of Alaska, commencing from the north shores of Dixon sound, sweeps in a long regular curve to the north-westward for 550 miles, to the vicinity of Prince William sound, and thence it trends south-westerly for a distance of 725 miles to the extremity of Alaska peninsula, where the chain of islands, known as the Aleutians, stretches towards the coast of Kamtschatka in a long curve, with the convexity to the southward.

The highest latitude of the great bend of the main coast-line north of Sitka is $60\frac{1}{4}^{\circ}$ in long. $145\frac{1}{4}^{\circ}$, in Controller bay; and the western and southern point of Alaska peninsula is in lat. 55° and long. 168° , where it is separated by the impassable strait of Isanotsky from the extensive but nearly snow-clad island of Unimak, rendered conspicuous by its volcanic peaks covered with perpetual snow.

North of the peninsula of Alaska the coast has a general direction northward to lat. 66° in the Arctic sea, indented by four large bays or sounds, respectively named Bristol,

Kouskoquim, Norton, and Kotzebue; and receiving among others the great river Youkon, which has its sources in about long. 180° W., in British America.

The extensive sheet of water north of the Aleutians to Behring strait, in lat. $65\frac{1}{2}^{\circ}$, and between the American and Asiatic continents, is known as Behring sea, and, so far as sounded, consists of very extensive submarine levels of remarkable evenness of surface at a very small depth. In it are several large islands, upon two of which, St. Paul and St. George, are located Russian factories.

Off the south-eastern shore of the Alaska peninsula lies the large island of Kodiak, which has numerous adjacent islands separated by narrow and navigable straits. North of the Kodiak group, and forming part of the eastern shore of the Alaska peninsula, is Cook's inlet, 159 miles long and 50 to 20 miles in width, penetrating the territory to lat. 61° , long. 150° , and receiving two large rivers near its head.

The great extent of water lying in the curve of the coast between Dixon sound and the south part of the Kodiak group has been named the gulf of Alaska.

From Dixon sound, in lat. $54^{\circ} 40'$, to the Chilkah river, in lat. $59^{\circ} 40'$, the main land is fronted by a vast archipelago of large islands, most of them having high mountains throughout, and all covered with a dense growth of vegetation. These islands occupy a space of about 75 miles east and west, and 265 miles N.N.W. and S.S.E.; they are divided by numerous navigable passages, one of which, named Chatham strait, stretches in a direct line 195 miles nearly N.N.W. from cape Ommaney, in lat. $56^{\circ} 10'$, to the mouth of the Chilkah, in lat. $59^{\circ} 14'$, with an average width of 7 or 8 miles, and great depth of water. This great strait has numerous anchorages and small bays, and several large passages connecting it with the other straits to the eastward, and two important ones with the sea to the north of Sitka. Of the latter, one passes through Peril strait and Salisbury sound to the gulf of Alaska, about 20 miles north of Sitka sound, with a navigable branch to Sitka, and the second through Cross sound, or Icy strait, to the gulf of Alaska, about 75 miles north of Sitka sound. The north shore of Cross sound is the southern part of the peninsula of the mainland lying between Chatham strait and the gulf of Alaska, and the termination of the great range of coast mountains that embraces mounts St. Elias, Fairweather, and Crillon. The group of large islands above described, embracing a shore-line of nearly 7000 miles, has been named the Alexander archipelago.

From Icy strait the coast is very slightly indented by bays up to the extreme northern part of the gulf of Alaska, in long. 144° . Here the extensive inlet with its islands and peninsulas, known as Prince William sound, stretches inland to the base of the great mountains for 60 miles, with a width of nearly the same distance. About 100 miles westward of this sound is Cook's inlet; the land lying between these two sounds is known as the Kenai peninsula.

The mountains of the Alexander archipelago attain an elevation of 2000 to 8000 feet. They have no valleys for cultivation between them, but they are densely wooded with firs and cedars, &c. Westward of Icy strait the coast mountain range rises to the height of about 8000 to 9000 feet, covered in most part with perpetual snow; on it are some magnificent snow peaks, one of which reaches the great height of nearly 20,000 feet, and is frequently seen at a distance of 150 miles at sea. Mount Crillon, in lat.

58° 40', long. 137°, is 15,900 feet high; mount Fairweather, in lat. 58° 55', long. 137° 30', 15,500 feet; mount Vancouver, in lat. 60° 12', long. 139° 35', 13,100 feet; mount Cook, in lat. 60° 12', long. 140°, 16,000 feet; and mount St. Elias, in lat. 60° 20', long. 141°, is 19,500 feet in height. The latter rises from a confused mass of broken mountains behind an elevated plateau, and is connected with mounts Cook and Vancouver, lying to the eastward, by a range of mountains of great elevation.

The peninsula of Alaska appears to be formed by a continuation of mount St. Elias range, broken or deflected at Prince William sound, and embraces some very high and volcanic peaks. The south-east shores of the peninsula are generally bold and rocky, and as far westward as abreast the island of Kodiak there is timber on the low margin of the coast, but gradually becoming scarcer to the west of Kodiak, when it ceases altogether.

Climate.—The North Pacific presents a peculiarly striking analogy to the North Atlantic in the existence of a great warm current, similar to the Gulf Stream, which sweeps along the eastern coast of Asia to the north-eastward, crosses the Pacific Ocean, and washes the north-west coast of the continent of America. This warm current brings to the shores of Alaska an enormous quantity of warmer water than is due to the latitude, which has an appreciable effect on the climate and temperature of this part of the American continent. In consequence of this accession of warmth there is a great development of animal and vegetable life. The sea swarms with fish in great variety and the land is for the most part densely and luxuriantly wooded with trees of gigantic growth. The rivers and fiords also possess an endless supply of salmon and other fish. Upon these fish and mollusca, the sea-otter by land, and the whale in the sea exist, and are at present the chief objects of profit to the natives and settlers.

According to the observations (1847—1864) carried on at the Sitka Magnetic and Meteorological Observatory the mean temperature throughout the year at Sitka is 42°·9 Fahr.—in spring, 41°·3; summer, 54°·3; autumn, 44°·2; winter, 31°·9. The average annual amount of rain, snow and hail, that fell during the period of these observations was about 83 inches, and the yearly average of days upon which rain, snow or hail fell, or heavy fogs prevailed, was 245, or two days out of every three. This enormous rainfall is in consequence of the prevalence of S.W. winds, which are charged with a vast accumulation of moisture after passing over the warm ocean current described above. The whole extent of country subject to these rains is covered with a kind of moss, known as sphagnum from one to two feet in depth; even on the steepest hill-sides this carpet is found to exist and to be saturated with water.

The prevailing winds in winter are easterly, and if from the southward are accompanied with rain and snow; but when from north-east the weather is generally clear and cold. The stormy weather commences in October; storms and tempests are frequent in November and December, and from the vicinity of Sitka the *aurora borealis* is frequently seen during clear cold nights. The winter weather breaks up about the end of March and vessels prepare for their first fur trading early in April, when the weather is cold but comparatively dry.

Military Posts.—Six military posts were established in 1867 by the United States

Government, viz :—fort Kodiak, fort Kenai, Sitka, fort Koutznou, fort Wrangle and fort Tongas.

Fort Tongas is situated on a small island, one of the Wales island group, immediately north of Portland inlet, and but a few miles above the southern boundary of Alaska. The vegetation at Tongas is almost tropical, some of the trees cut down in clearing for the military post were 7 and 8 feet in diameter. There is plenty of good timber in the immediate vicinity—principally fir, hemlock, and cedar. Fish of excellent quality can be caught in quantities right at the post; brook-trout of large size abound in the streams; venison, bears, ducks and geese can be purchased of the Indians, at nominal prices; the beach supplies clams and mussels.

Wrangle is pleasantly situated on Wrangle island, in the bight of a beautiful bay, called Etoline harbour, a few miles south of the mouth of the Stikine river. The scenery around this place is very fine. There is a large Indian village in the immediate vicinity. The timber on the island is mainly spruce, hemlock, and cedar. There is good grazing on the island; corn, potatoes and other vegetables are grown. The country has not yet been explored; no doubt valuable mines will be discovered when the proper explorations are made. Coal has been found in several places; Captain Mitchell, of the *Saginaw*, transported 60 tons from a mine near Sitka, to Victoria. Wrangle, from its proximity to the Stikine river, through which a large trade with the Indians of the interior can be carried on, its central position, and contiguity to the best salmon fisheries, will undoubtedly become a place of importance. A few gold miners still work the bars of the Stikine, but no large strikes are reported. (1867).

Space will not permit us to give a detailed account of the coast, sounds and islands, &c., of Alaska. We shall therefore conclude this chapter by simply giving a full account of the principal harbour on the coast, *i.e.*, Sitka or New Arkhangel.

SITKA SOUND.—The harbour of Sitka, in about lat. $57^{\circ} 3'$, long. $135^{\circ} 18'$, is a very picturesque one, with plenty of water for the largest ships to pass in and out, but a dangerous one, owing to the large number of islets and rocks, between which pass narrow channels, any of them with sufficient water to float a ship, but hardly sea-room enough to be safe. The entrance to the harbour is superb. Mount Edgecumbe towers up nearly 8000 feet above the level of the sea; its immense crater, filled with snow, marks the north-western boundary of the harbour, and can be seen at a great distance; Branor island is made up of mountains piled on mountains, having peaked summits and irregular outlines.

The town of Sitka, formerly New Arkhangel, is situated on a point of land jutting out into the bay, from the base of the mountains, probably containing about 1000 acres, and from the character of the soil appears to have been made by the washings of the ocean. On the point is a lake of fresh-water, in front of which, along the edge of the bay, are about 150 log houses, scattered about promiscuously. There is but one street, and that extends through the whole length of the town, and is continued for about a mile to Indian river, a little mountain stream emptying into the bay at this point. This is the only road on the island; beyond this, and in fact, on all sides of

the island, for some distance before you reach its termination, the thicket is impenetrable. This little river furnishes good fresh-water, cold as ice, and seems to get its supply from the melting snows on the summit of the mountains. To this little river the road leads, and was made by the Russians for the purpose of getting water, as the lake water is hardly fit to drink. There is not a well or cistern on the island, a large proportion of the water used being carried in small casks slung on a pole, on the shoulders of two men or women.

The Indians have a market here; they furnish any quantity of fish and game, charging a fair price for it. The following are some of the articles obtainable, with their prices, viz: :—deer, from three to four dollars; grouse, 25 cents each; ducks, 25 cents each; wild geese, 75 cents to \$1; snipe, 50 cents a dozen; clams, 25 cents a basket; halibut, as much as you can carry for 75 cents; cod, 50 cents for a big fish; salmon, during the season, from 10 to 25 cents each.

The following information respecting Sitka sound and harbour is by Assistant George Davidson, U.S. Coast Survey, and is extracted from the *Coast Pilot of Alaska*, Part 1, 1869:—

"Between point Woodhouse, Biorka island, and cape Edgecumbe, lying N. 46° W., 13 miles distant, is the entrance to Sitka sound, having a depth of 90 fathoms outside the middle of the entrance, and very bold water in every direction.

Biorka island is comparatively low and wooded, about 2 miles in extent north and south, and the same east and west. It has a sunken rock one mile southward of its south point, and several islets, but along its west and north faces the water is 30 fathoms deep close in-shore. On the north face of Biorka, 1½ miles east of the north-west point, is a small cove, opening to the northward, with soundings of 11, 9, and 7 fathoms inside the heads. Off the entrance to this cove are soundings in 25 fathoms, sandy bottom. The Russian navigators assure us this would make a good pilot station.

Two miles westward of the islet which lies off the north-west point of Biorka is an isolated sunken rock, where a heavy sea breaks only once every 5 or 6 minutes. It is said to have 10 feet of water on it, and, if so, must be very pointed.

The Russian navigators inform me that they have repeatedly watched the break upon it, and that the rocky patch of nearly a mile in extent laid down on the English chart of Sitka sound, No. 2337, does not exist.

All the adjacent islands are low and wooded, but the main-land is well marked by very high mountains.

Cape Edgecumbe is notably marked by the extinct volcano of mount Edgecumbe, bearing N. 52° E. distant 4 miles from the extremity of the cape. The shores are covered with timber to the edges of the bold high bluffs of rock and lava, fringed with innumerable rocks. The cape presents the appearance of a wooded plateau extending to the base of the mountain, interrupted only by two small hills between the cape and

* More recent information about this locality will be found on a subsequent page. See report of Lieut. F. M. Symonds, U.S. Navy, U.S.S. *Jamestown*, 1879—80.

mountain. But the great feature and landmark is the mountain itself, which is peculiarly marked, and has no counterpart in this region. It rises 2855 feet above the sea, and the top, forming the rim of an ancient crater, appears nearly horizontal, and has a diameter of 2000 feet.

Lisiansky says the basin of the crater is 40 fathoms deep.* The sides, from the summit down, have a gentle and regular inclination of about 25 degrees, are marked by deep furrows, destitute of trees or herbage, and present in sunlight a dull reddish appearance. In winter it is covered with snow. It is situated upon Pitt or Kruzoff island, of which the south and east sides form the north and west shores of Sitka sound and the passages northward, while its north side forms the south shore of Salisbury or Klokatcheff sound.

Off cape Edgecumbe the mountains Crillon and Fairweather, distant 125 miles to the N.W., are distinctly visible in clear weather.

From cape Edgecumbe the north shore of the entrance to the sound runs a general and nearly straight course of E. $\frac{1}{2}$ N. for 7 miles to Otmoloi point, or Point of Shoals, off which, at the distance of a mile, lie Low island and rocks, with a passage reported between the point and island. Nearly midway between these points, and $1\frac{1}{2}$ miles off shore, lies the moderately high wooded island of St. Lazara or Cape island, with 20 to 5 fathoms water between it and the shore.

The south shore, inside the entrance to Sitka sound, is broken by innumerable rocks and low wooded islets, and indented by large bays. The whole shore is covered with spruce, making it difficult to distinguish the islands. No sunken rocks are known to exist nearer the entrance than Williams bank, $5\frac{1}{2}$ miles N.N.E. from the north-west point of Biorka, and lying some distance off the low islands inside. The bank appears to consist of four or five sunken rocks, upon some of which the sea invariably breaks.

Within the entrance the sound contracts its width to 6 miles between Point of Shoals and Williams bank, with deep water to and inside that line. From Point of Shoals to Bouranoff point, forming part of the south shores, the bearing is E. by S., and distant $7\frac{1}{2}$ miles; and on this line the sound is contracted by Low island and rocks, one mile from Point of Shoals; by the Vitskari and adjacent rocks, 8 miles distant; by the Kulitch rock and adjacent sunken rocks, 5 miles distant from the same point. Deep channels exist between Low and Vitskari, Vitskari and Kulitch, and Kulitch and the islets off Bouranoff point, with, however, dangerous rocks in the latter. Between Vitskari and Otmoloi, Lisiansky gives soundings in 18, 17, 20, and 17 fathoms.

But the channel invariably used by the Russians is that between Vitskari and Kulitch. On the English chart this channel is erroneously contracted by the laying down of a sunken reef extending one mile east of Vitskari, nearly on the line towards Kulitch. In 1809 the Russian naval officers laid down 60 fathoms, two-thirds of a mile from Vitskari, on this bearing. The captains of the Russian-American Company state they have passed Vitskari along its south-east face within half a cable when steering

* The height of mount Edgecumbe given on the Admiralty chart is 2800; Belcher estimated it at 3150 feet; and Lisiansky, at 3000 feet.

a direct course to Mokhnatoi, a course N. 62° E., *trus.* We have made it close aboard when coming in at evening, with very thick, heavy weather from the S.E., and saw no breakers to indicate such a reef; in fact, were misled by not finding the breakers according to the chart.

Vitskari islet appeared, from the distance of a mile or two, to be about 40 yards long and 10 feet above high water, with a rough irregular surface; in smooth weather it has been landed upon.* From the north-west point of Biorka it bears N. 6° E., distant 7 miles. From the rock off Biorka it bears N. 21° E., distant 7½ miles.

Kulitch rock, situated about 2 miles E.N.E. of Vitskari island, is about 20 feet high, and less in extent than Vitskari. There are sunken rocks to the northward and S.S.W. of it, about half a mile distant, and one towards Vitskari, about a quarter of a mile off, with deep water and dangerous sunken rocks between the Kulitch and the islets off point Bouranoff.

For a distance of 4 miles inside of Vitskari rock we find clear deep water, up to the range of the wooded islands and rocks lying for 2 miles outside of Sitka harbour.

Through this barrier of islands there are three channels to the anchorages east and west of the town. These passages are known as the Eastern, Middle, and Western, the former being the longest, and the middle one the shortest, to either anchorage.

The approaches to these passages are free of all known dangers, except towards the Eastern.† The Zenobia rock has been imperfectly laid down; it has only 15 feet upon it at low water. A quarter of a mile eastward of it is the Kadin rock with 12 feet water. It is a sharp pointed rock, of very limited extent, and has 10 to 17 fathoms close to it.

In approaching the islands lying off Sitka in thick weather, the officers of the company endeavoured to find the island of Mokhnatoi‡, which is 20 to 30 feet high, rocky, and covered with a thick growth of spruce, the dark foliage of which, with the black rocks beneath, brought out in relief by the surf breaking along its front and on the outlying rock, makes it discernible through the fog when other islands are invisible. This islet lies between the Middle and Western channels, 5 miles N.E. by E. ¼ E. from Vitskari, and a vessel making it can take either, and safely run for the anchorage. When the fog is lifting, from the coming in of a westerly wind, this island appears first. Abreast Mokhnatoi the Western channel is about three-quarters of a mile wide, with a large reef, bare at low water, forming the western side; and the Middle channel is contracted by sunken and exposed rocks to a much narrower width.

The harbour of Sitka is very contracted. In the western anchorage numerous mooring buoys have been laid down near the town, although this part of the harbour is narrow and has three sunken rocks in it. The eastern harbour receives the greater sweep of the south-easters, and a heavy swell is said to be brought in from the sound, so that the company's vessels prefer to anchor in the western, as they can discharge

* A lighthouse has been proposed on Vitskari islet.

† Since these instructions were written several sunken dangers have been discovered in these passages. *see* report of Lieut. F. M. Symonds, U.S. Navy, of U.S.S. *Jamestown*, 1879-80, given on pages 398-397.

‡ There is now a beacon on Mokhnatoi island, described on page 394.

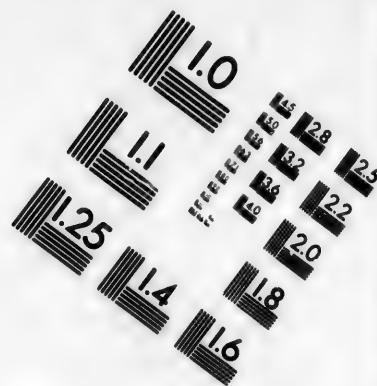
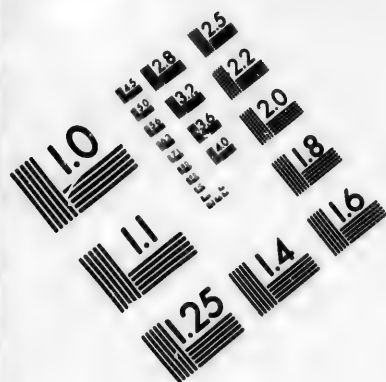
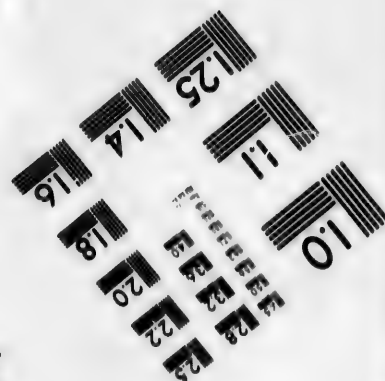
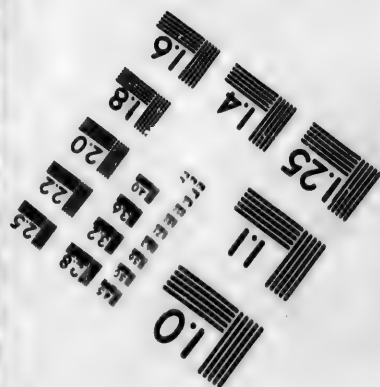
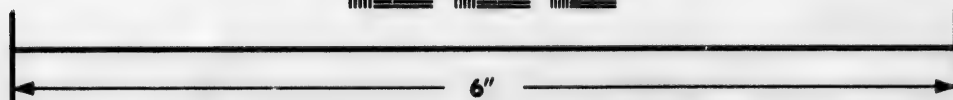
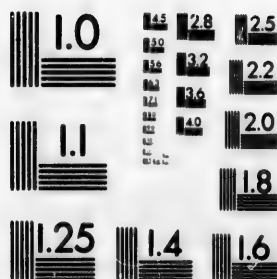


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more readily, and especially because during the winter the officers and crews are taken from the ships, which are left with only one keeper. The British men-of-war use the eastern harbour.

In the great gale of October 28th, 1867—the severest at this place for very many years—three or four vessels broke adrift from their moorings and several were driven ashore.

As the eastern harbour is larger than the western, free of sunken rocks, and easier of access, the adoption of it as the better anchorage for large vessels is confidently recommended.

The geographical position of the Coast Survey astronomical station, between the new United States barracks and the church, is lat. $57^{\circ} 2' 52''$, long. $135^{\circ} 17' 45''$.

Light.—From the cupola of the governor's house a light is shown to vessels entering the sound at night, to enable them to reach an anchorage. It is 110 feet above the sea, and is exhibited when two guns are fired. It shows over all the islands southwest of the anchorages. (1867).

Tides.—From the Coast Survey tidal observations of two months, from August 21st to October 21st, the mean rise and fall of the tide is 7.8 feet, and at the full and change of the moon 11.9 feet. The extreme range observed during the above period was 13 feet, and the least range 2.1 feet.

Sitka was the principal establishment of the Russian-American Company, and comprises about 120 good block-houses, storehouses, barracks, workshops, saw-mill's, churches, hospital, and the governor's headquarters. On January 1st, 1867, it contained 968 inhabitants, of which 849 were Russians, and the remainder creoles or half-breeds and Aleutians. Outside the stockade are 40 large Indian houses, facing the western harbour, and occupied by not less than 1000 Koloshes during the winter. The site of the town is cramped, and it is a mere question of time and expansion when these Indian houses will be removed. For years the Russians have had about a dozen guns directed along the face of the Koloshian village.

It would be useless to attempt to describe the labyrinth of channels and islets passing in every direction, like tentacula, from the sound, yet a few items may not be without interest.

About 9 miles S. & E. from Sitka (but 18 miles by the usual courses) are the rapids, connecting the waters of Deep lake with the S.E. part of Oserski bay. At these rapids, having a fall of 9 feet, a series of fish weirs have been constructed by the Russian Company in a very substantial manner, from shore to shore, and great quantities of salmon are caught and cured. In 1867, besides furnishing Sitka, the produce was 520 barrels, and there is ample opportunity to increase the catch fivefold.

A good passage exists between the north part of the sound and the eastern end of Salisbury sound, which enters from the gulf of Alaska, in $58^{\circ} 20'$, and continues through Peril strait to Chatham strait. The Coast Survey has made several preliminary examinations through these waters, and changed materially their shapes on the English chart; but they should not be run without a pilot of good local knowledge.

The Neva Passage, leading from the north entrance of Olga strait to Peril strait, is quite narrow, and has numerous sunken rocks along its shores. The Coast Survey

made a preliminary examination of it which indicated plenty of water, but made the passage narrower than laid down on the charts. With a thorough survey of this strait and of Salisbury sound, with its bold approaches, another entrance is afforded to Sitka sound to vessels driven north of cape Edgecumbe by heavy south-easters or by the currents in light airs.

A vessel once inside Sitka sound and unable to reach the anchorage, on account of heavy S.E. weather, will find two small bays and anchorage about 10 miles N.N.E. of Low point, and north of Vitskari.

Sitka sound was fairly represented by Vancouver, who named it Norfolk sound in 1794, but he did not enter it. La Perouse had very vaguely indicated the existence of a bay here, but its head was obscured by a fog. He applied no name to it. In 1775 Quadra named it the Bay of Terrors, and named the north point Cape Enganno. Tebenkoff describes its appearance as terrible in heavy south-east weather; but it is neither better nor worse than any other large open sound."

The following information relating to Sitka harbour and its approaches has been compiled from the report of Lieutenant F. M. Symonds, U.S. Navy, navigating officer, *U.S.S. Jamestown*, Commander L. A. Beardslee, U.S. Navy, commanding, who has just completed a survey of the locality (1880):—

Biorka Island, on the west side of the entrance to Sitka sound, is about 5 miles in length, and its greatest width, north and south, about $2\frac{1}{2}$ miles; it is densely covered with trees and tall grass, with some underbrush, but not as rank as that found at localities farther removed from the sea. There is a lake at the eastern end, the supposed outlet of which furnishes a place where vessels may easily obtain water by boats.

The western shore of Biorka island is bluff and may safely be approached to within a distance of 250 yards. The channel between it and a rocky patch to the westward is clear.

Caution.—The passage to the eastward of Biorka island is foul, being studded with sunken rocks, and is therefore not recommended.

On the north side of Biorka island, near its east side, is good anchorage in a bay lately surveyed by Lieutenant F. M. Symonds and Master G. C. Hanus, U.S.N., which has been named Symonds bay.

Symonds Bay.—Situated on the west side of the entrance to this bay is a nearly circular rock, 50 yards in diameter, which rises about 45 feet above high water mark. It is entirely barren, and is an excellent mark for that side of the entrance; it is known as Entrance island.

The eastern entrance point of Symonds bay is covered with trees on its western side; off its northern extremity is a small island, named Hanus. At night it is recommended to give Hanus island a berth of 200 yards, leaving it to port. By day it is only necessary to avoid the kelp patches. The first kelp patch on entering is on the western side of the bay and marks a rock with but two feet water over it at low tide. This rock is the only danger in the bay.

At the head of the bay is a gradually sloping white beach which can be seen a considerable distance at night.

Directions.—With the exception of the rocky patch to the westward of Biorka island the approaches to Symonds bay are free from dangers. Entrance island on the west side, and Hanas island on the east side, mark distinctly the harbour. Approaching the entrance, avoid the kelp patch to the northward of Hanas island, and give the island a berth of 200 yards to the westward, then head for the sand-beach, the centre of which will bear about S.S.E.

Anchor in 7 fathoms, avoiding the kelp on either shore of the harbour. Holding ground is good and anchorage sheltered against all winds except those between W.N.W. northward to N. by E.; N.N.W. winds blow directly into the bay. Fresh water and wood are in abundance.

Rocky cove, on the south side of Biorka island, is closed by dangerous sunken rocks and small rocky islands; its shores are covered with great quantities of drift-wood.

To a vessel coming up Sitka sound the islands about Sitka appear as one confused mass, but they may be approached boldly until the beacon erected by the *Jamestown* on the Beacon group is made out, after which a vessel's position may be plotted accurately and the desired channel chosen without difficulty.

Vitskari Island.—The *Jamestown* passed within half a mile eastward of this island, and found no reef there, nor any bottom at 15 fathoms. Three rocks or patches of rocks, lying apparently about a quarter of a mile apart, were observed to the N.W. of the island.

The beacon on Vitskari island is a conical stone building, 10 feet high, standing near the centre of the island. On the top of the beacon is a staff, 5 feet long, on the summit of which is a large stone, which is elevated 16 feet above the rock and 41 feet above high water. In clear weather it should be visible about 11 miles.

Kulitch Rock.—This rock bears from Vitskari island E.N.E. $\frac{1}{2}$ E., but is difficult to distinguish, as when approaching the latter island on a N.E. by N. course it is shut by the land of Bouranoff (Bouranov) point.*

The western breaker of Kulitch rock bears S. 7° W. from Mokhnatoi (Wooded) island beacon.

Kenobia Rock.—This rock has only 15 feet water over it, and not 18 feet as previously reported, and as shown on some charts.

Mokhnatoi Island.—The beacon on Mokhnatoi (Wooded) island has the form of a triangular pyramid; it is situated on the summit of the island. The beacon is 19 $\frac{1}{2}$ feet high; on its summit is a staff, 8 $\frac{1}{2}$ feet long, capped by a large stone, the whole rising 22 $\frac{1}{2}$ feet above the island and about 72 $\frac{1}{2}$ feet above high water. In clear weather it should be visible about 15 miles.

From Mokhnatoi beacon the beacon on Vitskari island bears S. $85\frac{1}{2}^{\circ}$ W.; mount Edgumbe S. $64\frac{1}{2}^{\circ}$ W.; and Kulitch rock S. 2° W.

A dangerous sunken rock, with only 9 feet water over it, on which the sea breaks during bad weather, lies S.S.W. $\frac{1}{2}$ W. 465 yards from the east point of Mokhnatoi (Wooded) island.

* From this it would appear that both Vitskari island and Kulitch rock are placed on the present charts too far north with reference to Bouranov point (*U.S. Hydrographic Office*).

Eckholm Island.—A beacon is also erected on Eckholm island (Beacon group), which is similar in size and construction to the one on Mokhnatoi (Wooded) island.

Pritchard Shoals.—A reported dangerous shoal shown on all charts of the locality, covered by 8 feet and bearing North (easterly) from Passage (Goloi) island does not exist in, or near, the reported position, but is undoubtedly an erroneous position of the western of the Pritchard shoals.

Mitchell and Rose Rocks.—These rocks are incorrectly placed on present charts. They lie near the fairway and should be left to starboard in entering. The centre of Turning (Povorotni) island, bearing N. by E., clears both, and leads through mid-channel between the western of Mitchell shoals and a 3-fathom spit extending E.N.E. about 800 yards from Volga island.

The shoal lying nearly west from Passage islands is of greater extent than heretofore supposed, and narrows the channel between Passage island and Surf rocks (Bolivnoi islands) to about 250 yards, which renders its use unadvisable, even in fine weather.

Keene Rock.—This danger, situated dangerously near the track of vessels using Middle channel, is about 10 yards in diameter; the least depth found upon it was 16 feet at low water, with 4 fathoms close to in all directions, and 7 fathoms within a boat's length from it.

From Keene rock, the west extreme of Nepovorotnoi rock (Rockly island) bears N. 29° W.; the south extreme of Volga island N. 88° E.; the western extremity of Quitoway (Whale) island S. 71° E., and the south extreme of Mokhnatoi (Wooded) island S. 68° W.

The centre of Surf rocks (Bolivnoi islands) bearing S.W. $\frac{1}{2}$ S. leads one cable south-east of the rock.

Another rock, with only 14 feet water upon it, lies about 75 yards S.E. by S. from Keene rock.

Rock.—A dangerous rock lies N.N.W., about 800 yards from the northern extremity of Signal-light island (on the east side of the Western channel), and from the rock a shoal with 9 to 18 feet water upon it extends N.W. about 180 yards.

Whiting Harbour.—This harbour, in which the holding ground is good, and excellent shelter found against north-easterly gales, is situated on the south side of Japan island, or between the south shore of that island and the islands to the southward of it, viz.: Survey island and Lodge group.

Jamestown Group.—This name is given to the group of islands (heretofore unnamed,) the N.W. extremity of which lies S.W. by W. $\frac{1}{2}$ W., about 970 yards from the north-west point of Thompson (Galankin or Sandy) island, and extends thence in an E. $\frac{1}{2}$ S. direction for a distance of about 840 yards.

Jamestown Bay is situated on the south side of Jamestown group. Fresh water may be obtained there, to facilitate which a small jetty has been built by the crew of the *Jamestown*.

Rockwell Island.—This island, the centre of which lies about N. $\frac{1}{2}$ W. 610 yards from the centre of Wooded island, is about 225 yards long on a line running N.W. and S.E. through the centre of the island. It is wedge-shaped (when looking down upon it or from a bird's-eye view), the south-east extremity forming the point and its

north-west side the base, which latter trends about N. by E. and S. by W. for a distance of 480 feet.

Survey Group.—This is a name given to an important group of islands lying about a quarter of a mile N.E. by N. from Signal-light island, and on the right of the entrance to Whiting harbour.

Several other islands of less importance have been named by the Jamestown surveying party, all of which will appear on the new charts when completed.

Directions.—Entering Sitka harbour in a sailing vessel with the wind from the north-westward, it is advisable to give the mount Edgencumbe shore a wide berth, as under the influence of that high land the wind is apt to fall and fall calm when the vessel is in the vicinity of Vitskari.

Biorka island should be given a berth of at least $2\frac{1}{2}$ miles. To clear the sunken rocks to the westward of this island, keep the beacon on Vitskari island bearing eastward of N. $\frac{1}{4}$ E., or, in other words, do not bring the beacon to bear to the northward of N. $\frac{1}{4}$ E.

In entering the harbour leave the beacon on Vitskari to port half a mile, then steer for Mokhnatoi beacon, leaving it on the starboard hand in passing into the Western channel.

Eastern Channel.—After passing Vitskari island steer N.E. $\frac{1}{4}$ N., until the beacon on Eckholm island (Beacon group) bears E.N.E., after which Eastern channel may be entered with safety, care being taken to avoid the Zenobia and Kadin rocks, the positions of which are reported to be doubtfully laid down on existing charts. Vessels are recommended to keep well on the south side of the passage, to clear Simpson's shoal and Tzaritsa rock.

Middle channel.—This channel is full of dangers, and the present charts are neither sufficiently accurate nor complete to indicate the route to follow in order to avoid them. It is therefore not recommended to strangers, but in case it is necessary to enter by this channel, the dangers in it will best be avoided by passing between Passage (Goloi) and Beardslee (Kayaktch) islands, instead of between Passage island and Surf rocks (Goloi and Bolivnoi islands,) or between Surf rocks and Wooded island (Bolivnoi and Mokhnatoi islands,) as indicated on the Admiralty charts.

Western channel.—In navigating this channel care should be taken to avoid the shoal lying S.S.W. $\frac{1}{4}$ W., 465 yards from the east point (S.E. extremity) of Wooded island, which latter is now distinguished by a triangular pyramidal, wooden beacon; and also the shoal lying N.N.W., 800 yards from the north extreme of Signal-light island (see pages 394, 395).

Anchorage.—With regard to the anchorage at Sitka, Commander Beardslee remarks, that, ordinary gales blowing from S.E. and S.W. outside are deflected to N.E. and South, respectively, before reaching the inner anchorage. Very heavy S.E. gales however, are not deflected, but blow home with a force greater than is felt from any other direction.

Occasionally a heavy N.E. gale sends through the valleys, which traverse the island from Silver bay, heavy squalls from E.N.E.

For these reasons it is necessary to moor very securely, if it is contemplated to remain during the winter or for any length of time.

Moorings.—The *Jamestown* after several trials was eventually moored in the western harbour with her head about E. by S., abreast the Indian village to the westward of Sitka town, with the eastern extremity of Harbour island bearing S.E. $\frac{1}{2}$ S. and the east point of Japan island S.S.W. $\frac{1}{4}$ W.

Commander Beardslee recommends the above anchorage to vessels visiting the harbour with the intention of remaining for a length of time, and suggests, as a necessary provision against accidents, that vessels be supplied with extra bowers, stream anchors and cables, because if any of these are lost they cannot be replaced in Sitka.

The hull of a vessel anchored in this position is well sheltered from the heavy squalls which rush through the gulch to the northward; inasmuch as they generally pass over the ship and strike the water some distance outside of her, the spars only catching the force of the squall, and for this reason it is well to send down all the upper spars when moored for sometime.

Tides.—The corrected establishment of the port of Sitka is 12h. 30m. Mean rise and fall of tides 8 $\frac{1}{2}$ feet; extreme range of spring tides (same day) 10 $\frac{1}{2}$ feet.

CHANGES IN NAMES OF PRINCIPAL ISLANDS IN SITKA SOUND.

NEW NAMES.	NAMES ON U.S. COAST SURVEY CHARTS.	NAMES ON BRITISH ADMIRALTY CHARTS.
<i>Beacon group</i>	Ekgalit-tch	Eckholm islands.
<i>Balkanap island</i>	Ekgalit-tch (Southern island)	Eckholm (Southern island)
<i>Liar rock</i>	False rock	Liar rock
<i>Thompson island</i>	Sandy island	Galankin island
<i>Beardslee island</i>	Kayakteh island	Kayaik island
<i>Survey island</i>	Sasedni island .....	.....
<i>Long island</i> ..	Long island	Dolgay island
<i>Russian island</i>	Bamdorotchnoi	Bamdo-roshni
<i>Whalebone island</i>	Whalebone island	Quitoway island
<i>Luce island</i>	Emheleni	Emgayten island
<i>Ship island*</i> }	Error island	Oshipki
<i>White island*</i> }		
<i>Johnson island*</i>	Berry island .....	.....
<i>Hawley island*</i>	Boidarka .....	.....
<i>Fasset island*</i>		
<i>Entrance island</i>	The Twins .....	.....
<i>Horney island</i>	Rogova island .....	.....
<i>Gull island</i>	Kukh-kan island	Kuch-kan island
<i>Turning island</i>	Turning island	Povorotni
<i>Ball island</i>	Aleutski	Aleyoutski
<i>Harbor island</i>	Harbor	Gavanski island
<i>Japan island</i>	Japanese island	Yaponskoi island

* These five islands were formerly known, collectively, as a group, under the name of BOIDARKA ISLANDS by the U.S. Coast Survey, and KUTOHUMA ISLANDS by British Admiralty.

ISLANDS AND ROCKS OFF THE COASTS OF CENTRAL AMERICA AND CALIFORNIA.

*Magnetic Variation in 1880 :—At Cocos Island 8° E. ; Malpelo Island 7½° E. ;
Clipperton Rock 7° E. ; Revillagigedo Islands 9° E. ; Guadaloupe 12½° E.*

There is little, if any, annual change.

COCOS ISLAND.—This island is about 4 miles in extent, and its northern part, Chatham bay, lies in lat. 5° 32' 57", long. 86° 58' 22", according to the determination of Sir Edward Belcher in 1888. It is of considerable height, particularly the western part, and when viewed from a distance of 18 or 20 miles, on a bearing of N. 78° E. to N. 81° E., its south-west extremity appears to rise abruptly from the sea, in steep rugged cliffs, to a considerable height, and then in a more moderate ascent to its most elevated part, which is a hill of no great size, whence it descends more uniformly to its northern extremity, which appears like a detached islet. When viewed from the northward, opposite the bays, the shores appear to be composed of broken perpendicular rocky precipices, beyond which the surface rises unevenly to the summit of the island, the whole covered with a thicket of small trees near the shore,—but on the more elevated land in the interior, with large spreading trees. This island can be seen more than 20 leagues off; but of its interior little is known, except that it is rocky and mountainous, and probably contains a large lake or sheet of water, such having been seen by some of the party under Sir E. Belcher. Its shores have only partially been examined, and principally at the northern part of the island, where there are two bays containing moderately good anchorage. Off the coasts are several detached islets and rocks, which extend some distance, and particularly from the S.W. part of the island, where they run off fully 2 miles, and would be dangerous, if it were not that they are sufficiently high to be seen and avoided. The lower parts of these detached islets consist of a belt of white barren rock to the water's edge, and their tops are generally covered with trees. The coasts of the island are generally steep perpendicular cliffs, against which the sea breaks with so much violence as to preclude an attempt to land in any part except in the bays on its northern side. In many parts of these cliffs are falls of excellent water, a supply of which, it is said, can easily be procured, as well as cocoa nuts, and plenty of wood for fuel.*

Captain Colnett, who visited the island in 1798, says :—"The western side of the island is the highest, and presents itself in the form of a round hill. The eastern side appears to be much broken, the land sloping in most parts abruptly to the sea, but in

* This is according to Vancouver; but it has since been stated that all the trees have been cut down.

others presenting bold and perpendicular cliffs. The island does not appear to possess a spot where trees can grow that is not covered with them or some kind of bushy plant, which, when blended with the barrenness of intervening rocks, produces a picturesque effect; while the streams pouring down from their various fountains to the sea greatly heighten the beauty of the scene. It is Tahiti on a small scale, but without the advantage of its climate, or the hospitality of its inhabitants."

Vancouver appears not to have had so favourable an impression of the island, as Captain Colnett. "This island cannot be considered as having a pleasant appearance in any one point of view, for although its inland surface is much diversified by hills and valleys, yet the only low land of any extent that we were certain it possesses is in the bottoms of the two bays, each of which forms the extremity of one of these valleys, bounded by craggy precipices, from the foot of which extends a narrow strip of low flat land that terminates in a beach at the water side, resembling more the dreary prospect exhibited at the heads of the several branches of the sea we had so recently explored on the coast of North-West America, than anything else I could compare them to.

Every other part of the shore seemed to be composed of steep broken precipices of rock, of which substance the interior of the island was apparently composed, as the naked cliffs were frequently seen protruding their barren sides through the thicket, which otherwise covered the surface of the island. This thicket, so far as we were able to ascertain, was chiefly composed of a great variety of trees of a moderate size, with an impenetrable underwood of the vine or supplejack kind, which opposed any excursion into the country; some attempts were, I believe, made to penetrate there by the water course, but this, from rocky precipices and other obstructions, was found to be equally impracticable; our knowledge of its productions must consequently be confined to our observations on the small margin between the woods and the sea shore, the only part that was accessible to us."

The primary advantage of Cocos island is the abundant supply of water which it affords. This abounds in every part, and is to be easily procured at the stations to which vessels can resort. From its purity and limpid appearance, and from its being destitute of any colour or unpleasant taste, either from dead leaves or other decayed matter, Vancouver was led to infer, although heavy rains had fallen during his stay in January, 1795, that the larger streams of water have a more remote and permanent source than accidental showers. The soil in the immediate vicinity of the streams falling into the bays is of a poor, loose, sandy nature; but at a little distance behind the beach, and in the fissures of the rocks, there is a rich black mould, apparently of great fertility, and this is probably the case in other parts of the island. All the vegetable productions of the island grow luxuriantly. On the rocky cliffs near the sea, where the uneven surface will permit anything to grow, there is a coarse kind of grass which affords an excellent retreat for the sea-fowl, and also a particular kind of tree, something like the cloth plant of the South Sea islands, but much larger. Some of these trees grow to the height of 80 feet, and have a brightish coloured bark, free from branches to the top, where the leaves fall over, giving the trees the appearance of umbrellas. Besides these trees there are others in the interior, occasionally of a considerable size.

Chatham Bay.—The north-easternmost anchorage of the island is named Chatham bay, from the armed tender accompanying Vancouver. It is not very large, and off its east and west points are two islets, the western and larger named Nuez, and the eastern Conic; these afford protection from the sea, especially the western islet. The width of the bay from point to point of the islets is about a mile, in a direction of S. 52° E., and N. 52° W.; and from this line of direction its extent to the bottom of the bay is also about a mile. The soundings are regular, of from 12 to 50 fathoms, and vessels may ride very snugly within less than half a mile of the beach, in about 20 fathoms water, but in a less depth the bottom does not appear to be so free from rocks. Here Vancouver anchored, in January 1794, in 88 fathoms, on a sandy and gravelly bottom, apparently good holding ground and free from rocks. The east point of the bay, which is a small conical islet lying close to the north-east extremity of the island, bore S. 51° E., half a mile; the west point of the bay S. 75° W.; a steep rocky islet lying off it, from S. 87° W. to N. 66° W.; and the watering place at the mouth of a very fine stream, emptying itself over a sandy beach S. 13° W., about three-quarters of a mile. Within this the *Chatham* also anchored, in 26 fathoms, similar bottom.

Sir Edward Belcher says, that in Chatham bay a vessel may anchor in 6 fathoms, within a quarter of a mile of the beach, but the best anchorage is in 12 fathoms. There a constant draught will be experienced between the openings of the islets, and a vessel can generally enjoy the refreshing sea-breezes, and fetch out at once, clear of the dangers, which are but few.

From the depth of 20 fathoms, the soundings outside of Chatham bay soon deepen to 40 and 50 fathoms, the latter at only 1½ miles from the shore. Both this and Wafer bay afford good protection from the winds prevailing during the early months of the year; and from the abundance of the vegetation growing close to high water mark, it would seem that neither of them are subject to violent storms, or heavy seas.

Wafer Bay.—At about a mile westward of Chatham bay is Wafer bay, which is more extensive and exposed than it, and its soundings are neither so regular, nor is the bottom so good. Into this bay a large stream of fresh water flows, and the sea breaks heavily. Captain Colnett appears to have preferred this bay to Chatham bay; he says:—"It may be easily known by a small rugged barren rock, about the size of a large boat, bearing West of the body of the bay about 5 or 6 miles. It lies East and West, and its greatest depth is not 2 miles, nor is it one in breadth; but I would not venture into it in a vessel of more than 200 tons. Its anchorage is in from 7 to 50 fathoms, and is nearly sheltered from all winds. This bay is also preferable to that at the north point, because the shore of the first is steep; while that of the latter consists of a beautiful valley and sandy beach, where cocoa trees appear in greater numbers than I have seen in any other place. There is also a rivulet of water 18 or 20 feet in breadth, which is supplied from a basin a mile inland, in which our crew, to avoid the sharks, went and bathed. Although this bay is so small, it is very convenient, and as secure as the anchoring places generally are which are not entirely sheltered. Its principal inconvenience arises from the constant rains, as out of the four days we were beating off it, it rained during three of them, and sometimes with

heavy storms of lightning and thunder. Those on shore experienced an equal amount of wet weather ; and so thick was the rain, that, for eight hours together, we were not able to see twice the length of the ship ; but this may not be the case at all seasons."

Of Wafer bay it may be said that one of its principal inconveniences is the heavy rollers, particularly at low water, at which time the flat extends out a considerable distance. It is also more subject to calms than Chatham bay, and consequently not so easy of ingress and egress ; and being exposed to westerly winds, watering at all times is difficult, and at low tide quite impracticable.

The climate at Cocos was considered by Vancouver to be temperate and salubrious. The thermometer, in January 1795, was usually between 78° and 80° , yet the heat was not so oppressive as was experienced farther to the northward, and no inconvenience was experienced from the heavy rains.

The rise and fall of the tides by the shore are very considerable and regular, twice in the 24 hours, without any apparent stream, and are not influenced by currents. The night tides appear to be the highest, and probably rise 10 feet perpendicularly ; but at the time of the observations, the surf was too high to permit a very correct measurement. The time of high water is about 2h. 10m. after the moon passes the meridian.

Cocos island appears to be well provided with sea-fowls : pigs, also, were left there by Captain Colnett, which appear to have increased and multiplied considerably. Fish are abundant, but difficult to catch ; eels are large and numerous, as also are the turtles, but they appear shy of coming to the land. It is said that there are a large number of rats of the white and brown kinds on the island, also land crabs of a prodigious size, and that goats are in the interior, but keep to the heights.

MALPELO ISLAND.—The actual geographical position of this island has not been ascertained, but approximately it is lat. $4^{\circ} 0'$, and long. $81^{\circ} 32'$. It is a high, barren, and perpendicular rock, visible about 20 leagues. A small quantity of green moss, and a few dwarf bushes grow in its cracks or gullies, and are the only signs of vegetation it possesses. It is surrounded with islets, and the whole may extend about 9 or 10 miles in a north and south direction. The centre of the island bears a resemblance from several points of view to the crown of a head ; and its being barren accounts naturally enough for the name Malpelo, which the Spaniards have bestowed on it, which signifies *bald head*.

In the vicinity of this island the currents are strong, and have much the appearance of breakers ; the set appears probably to be to the N.E. by E., at the rate of $2\frac{1}{2}$ miles an hour.

CLIPPERTON ROCK.—This rock is in lat. $10^{\circ} 17'$, long. $109^{\circ} 10'$; it is sufficiently lofty to be seen from a distance of 12 or 15 miles. When first in sight it appears not unlike a sail, but on a nearer approach it presents the appearance of an immense castle. The colour is very dark, in fact nearly black. This most dangerous rock and shoal is but little known, and thought by many not to exist. Its vicinity is generally indicated by the presence of numerous sea-birds—the white gannet, wide-awake, and booby, which are often found as much as 50 or 60 miles from the rock.

The above position of Clipperton rock is from the determination of Sir Edward

Beleher, but it has recently been stated that its more correct position is lat. $10^{\circ} 18' 24''$, long. $109^{\circ} 7' 30''$. The island is between 7 and 8 miles long, and is almost an even height from one end to the other, being only 6 or 8 feet above the sea-level. The rock in its highest point is about 150 or 170 feet; and the width of the island is about 1700 or 1800 yards. The island is composed of the whitest sand, and the only appearance of vegetation is one continuous fine brown line, supposed to be of grass or rushes. The rock is conical, unequal, and jagged, and at the northern end has a circular hole right through, about fifty feet from the top. The sea breaks over the whole extent of the island to windward, and at the north-east and south-west ends, at different distances from the sand-bank. It has been observed that, "as the calms are sudden in these latitudes, and the winds variable (Clipperton being on the edge of the south-east trade-wind), if vessels are anxious to sight the rock, they should pass to the eastward of it, as the western side is evidently the windward side; if it becomes calm when they are in the neighbourhood, there is less danger when they are to leeward, and the swell will throw them off. Clipperton is the most naked solitary danger that imagination can picture. The sand bank seems ill able to support the weight of the huge rock, and the rock itself appears to be sinking from its treacherous foundation. The sight of this tremendous and distressing danger, and the reflection it calls up of the awful calamities it has been the cause of, reminds one of the sublime truth of M. de Lamartine's remark, when he was surveying some of the ruins of the hill of Baalbec, that 'Silence is the only language of man, when what he feels outstrips the ordinary measure of his impressions.' There is an association with the ruins in the midst of a desert, and this solitary rock standing in the midst of the pathless ocean."

In May, 1839, Clipperton rock was visited by Sir Edward Beleher, and after mentioning that for a distance of about 15 miles, it presented the appearance of a brig close hauled, owing to the sun's rays playing on its nearest face, he proceeds to say:—"The name, Clipperton rock, certainly misled us, and had we made the point at night, with a fair wind, would, almost *inevitably*, have severely damaged or destroyed both vessels. I certainly should have steered to pass it to the northward; merely assuming it to be a solitary rock.

Nothing in this name would lead a seaman to imagine a high rock, placed on the southern edge of a coral lagoon island, three miles long north and south, by the same east and west.

Its description should stand thus:—A very dangerous low lagoon island, destitute of trees, with a high rock on its southern edge, which may be mistaken for a sail.

This rock can be seen 15 miles. In thick weather the low coral belt, which appears like sand, will not be distinguished until close to it. The breakers on the eastern side of it do not afford sufficient warning for a vessel to trim or change course. On the northern part of the belt the land is a little raised, and appears to be clad with something like grass.

There are two entrances, which at high water may be safe; but at the moment we passed, the surf was too heavy, and the reflux showed the rocks bare. The dangers from the rock, northerly, extend two miles easterly, and the same north-westerly. On the beach several large trees were observed, and an object which was thought to be part of a vessel, near the western opening.

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In the centre of the lagoon, as viewed from the mast-head, there is one large hole of blue water, and a second belt is connected with rock, attaching it to the eastern side of the island. This literally constitutes two islands, formed by its two openings; both are on the *weather* side of the island.

No living trees were seen, but the whole island was covered with gannet, boobies, frigate, pelicans, and several kinds of tern, which had also been noticed in great numbers during the previous week, at least 500 miles to the eastward. From this, an easterly current may be inferred, as these birds generally keep in its stream or tail course.*

No bottom was obtained by the *Sulphur*, with 100 fathoms of line, but the *Starling* had soundings with less than 100 fathoms on the northern side of the island.

Sharks, porpoises, and turtle were observed together. The former annoyed us much by biting at our patent logs, for which one was taken, and made an example of. They were very large, and literally swarmed. In all probability, they were attracted by a shoal of file (balistes) and other small fish which had been feeding off our copper since quitting the island of Cocos."

REVILLAGIGEDO ISLANDS.—This is a group of islands in lat. $18^{\circ} 48'$, the largest of which, Socorro, is stated to be nearly 80 miles in circumference. They are evidently of volcanic origin, and are said to supply neither wood nor water. The name Revella Gigeda, or Revillagigedo as the islands are more generally called, was given by Colnett in 1798, in compliment to the Viceroy of Mexico, from whom he had received much kindness and civility.

Socorro.—This island is lofty, making in several peaks, the highest of which is about 8400 feet above the sea level. The extent of the island in a N. by W. $\frac{1}{4}$ W. and S. by E. $\frac{1}{4}$ E. direction is about 10 miles, and its average breadth is about 7 miles. It may be said to consist of one mountain, which can be seen at the distance of about 20 leagues in clear weather, falling in a gradual descent on the south side. It is in a great measure covered with brush-wood, intermixed with the low prickly pear-trees, and occasionally shaded with other trees of a larger growth. Some few patches of the soil are black and barren, as if fire had lately issued near it; and the top of the high land has the appearance, from a distance, of being an extinct volcano; the surface is of a whitish colour, like that of pumice-stone. Although Socorro has not recently given evidence of volcanic action, there is little doubt that the whole of this group of islets originated from that source.

Off the north and west coasts of Socorro are some detached rocks; and some rocks lie off the southern shore, which is a high bold coast (*see* plan).

There are two bays on the southern side of the island, affording anchorage to vessels, viz:—Braithwaite and Cornyallis bays.

Braithwaite Bay is an open roadstead, exposed to the eastward and southward; in it the soundings are 17 to 10 fathoms, sand and coral. Its position is lat. $18^{\circ} 42' 57''$ and long. $110^{\circ} 56' 58''$, according to Commander G. Dewey, U.S.S. *Narragansett*,

* It does not therefore follow, as a matter of course, as noticed by some writers, that the appearance of birds denotes land to windward; they are more likely guided by tide.

1874, who remarks:—"There is good anchorage in the fine season—that is, from December to June—in Braithwaite bay. This bay, or cove, is on the south-east side of the island, and may be recognized by its stony beach, the only one on the island, all other parts of the coast being iron-bound. There is a good landing-place at the bottom of the cove, and our observation-spot was on the small sand-spot near the landing-place.

To anchor in this bay, bring the highest peak of the island to bear N.W. by N., and anchor in 10 or 11 fathoms, a quarter of a mile from the beach.

Cape Henslord, on the north-west side of the island, is a perpendicular bluff 100 feet high. O'Neal rock, 45 feet high, lies $1\frac{1}{5}$ miles N. by W. of cape Henslord.

Cape Middleton, the northern point of the island, is a perpendicular bluff 50 feet high. Two small rocks, one 50 feet and the other 15 feet high, lie about a mile north-east of this cape. All the eastern side of the island consists of perpendicular bluffs from 15 to 100 feet, with no landing-place even in fine weather.

Cornwallis bay, on the west side of the island, affords a good anchorage in easterly winds. It is necessary to approach quite near to the white coral beach, as the water is deep. The highest peak of the island bears from the anchorage E. $\frac{1}{2}$ S."

Sir E. Belcher observes respecting this bay (1840):—"The landing is rocky, with shores of lava *coulé*, and nothing like a beach. Neither wood nor water was visible, although from the constant clouds which hang over the high peaks, there must be a supply in some other point. Lieut. Wood was despatched to examine the westward bay for wood or water. His report (not having landed) was, 'that goats were observed, the bay spacious, but no indications of wood or water visible.' It is probable that the goats find water. I found it difficult to penetrate into the interior of the island, even for a few hundred feet, owing to the prevalence of the *cactus*.

San Benedicto Island.—This island is distant about 86 miles N. $\frac{1}{2}$ E. from the summit of Socorro, and is in lat. $19^{\circ} 19'$, long. $110^{\circ} 49'$ (Com. Dewey, U.S.S. *Narragansett*). When viewed from southward, it has a barren appearance, with little or no vegetation. It is about $2\frac{1}{2}$ miles long, in a N. by E. and S. by W. direction, and half a mile in breadth, and has a few rocks, just above the water, off several parts of it. Its surface is uneven, and its aspect is described as romantic, as it has the appearance of two distinct islets, when seen from a distance of 9 or 10 miles. The highest peak is near the southern end, and has an altitude of 812 feet. Another peak, 708 feet high, is near the middle of the island.

On the eastern side of the island, near the middle, is a small shingle beach, where boats might land in good weather.

There are three small detached rocks off the west side, near the northern end and very near the island, from 60 to 200 feet high. A dangerous sunken rock, with 10 or 12 feet of water on it, lies 1 mile west of the extreme western point of the island.

Roca Partida.—This is a dangerous barren rock, 100 yards long, in a N.N.W. and S.S.E. direction, lying in lat. $19^{\circ} 0'$, long. $112^{\circ} 7'$ (Com. Dewey, U.S.S. *Narragansett*). Its breadth is only 50 to 60 yards, and both ends are 80 to 90 feet in height, the north-west end appearing forked, and the south-east end like a ragged hay-cock. The two heights are separated by a ragged saddle, which rises 18 or 20 feet above the surface of the sea, and is nearly perpendicular. At a boat's length from the rock

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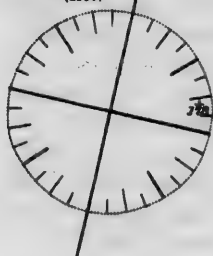
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GUADALOUPE ISLAND

Nautic Miles
0 1 2 3 4 5 6 7 8 9 10

Soundings in Fathoms

Var. 12° 30' E.
(1880)



ALIJOS ROCKS

Half Nautic Mile
0 1 2 3 4 5 Cables

Lat. 24° 58' 0" N.

Var. 10° 45' E.
(1880)



Long. 115° 40' 0" W.

ROCA PARTIDA

Scale of Feet
0 50 100 150

(Soundings in Fathoms)

Lat. 19° 0' N.

Var. 9° 0' E.
(1880)



Long. 115° 30' 0" W.



there are 85 fathoms; and at half a mile off, 50 fathoms; and afterwards no bottom with 100 fathoms of line. The rock appears from every direction like a sail under a jury-mast.

Clarion.—Westward of Socorro and Roca Partida islands is Clarion, a small island of considerable height, and very similar in its natural features to Socorro island. The hills are lofty, the highest peak, near the west end, being estimated to be 1100 feet high, and when bearing to the N.E. they make in three hummocks, which give the island, from a distance, the appearance of three distinct islets. It is probable that contains but little fresh water, although there must be a great deal precipitated from the clouds, which almost constantly hang over the high land. Neither wood nor other necessities can be obtained, still a vessel in great distress might have her wants to some extent relieved.

The island is about 5 miles long, and 2 miles broad, and has been but little examined, particularly the north shore. On its southern side is a small bay named Sulphur, the east side of which is, according to Commander Dewey, in about lat. $18^{\circ} 20' 80''$, long. $114^{\circ} 45'$; in this Sir Edward Belcher attempted to moor, but was prevented by the breaking of his anchor. The east end of the island appears to be steep and precipitous.

Commander Dewey says:—"There is a tolerable anchorage in northerly winds in Sulphur bay, on the south side of the island, and about midway between Shag rock and Rocky point. The best anchorage is in 12 or 18 fathoms, $\frac{1}{3}$ of a mile from the sand-beach.

All other parts of the coast of this island are iron-bound, consisting of perpendicular bluffs from 80 to 600 feet high. A remarkable monument rock 200 feet high, with several others near it, lies off the north-west point of the island. Another detached rock 25 feet high lies 4 cables off the north side.

A salt-water lagoon is near the beach at Sulphur bay, but no fresh water could be found. As doves are quite numerous there must be a supply somewhere on the island.

Fish and turtle are numerous, also many varieties of sea birds."

In the vicinity of Clarion, several islands have been reported, and Sir Edward Belcher sought for them for a considerable time, without success. It may therefore be concluded that as the position of the island was not till lately accurately ascertained, it has been seen by various parties, and reported by each as a distinct discovery.

ALIJOS ROCKS.—This is a very dangerous group of rocks, lying off the coast of California, in lat. $24^{\circ} 57' 25''$, long. $115^{\circ} 47' 30''$. The southernmost and largest rock is about 110 feet high, and there are many above and under water close to it.

GUADALOUPE.—This island is northward of the Alijos rocks, and its north point is represented to be in lat. $29^{\circ} 10' 50''$, long. $118^{\circ} 18' 30''$. It is about 15 miles long by 5 miles broad, and is very lofty in the interior, a chain of hills extending through the whole length of the island. The highest of these hills is over 2000 feet high, and one near the north point of the island is estimated to be even 8412 feet in elevation. The island can be seen a distance of about 60 miles, and will appear, when bearing either east or west, lower at its southern extremity than at its northern.

Off the south end of the island are two rocky islets at some distance from the shore, the outermost of which is 500 feet high. The shores are in general bold, but have

not been closely examined; although it is said that a small cove exists on the south-east shore, which is formed by some rocky islets, and contains the only anchorage in the island, the riding being in 7 fathoms, and the shelter from all winds except those between S.E. and E.N.E.

But few supplies of any description can be obtained here, the island being quite barren and rocky, and affording very little sustenance for any thing except goats. It is said that wood and water may be obtained from a cove on the north-east side of the island.

Vancouver says that the Spaniards were accustomed to make this island when bound southward from Monterey, or from their other northern settlements; in which route they passed westward and out of sight of the California islands, for the advantage of continuing in the strength of the N.W. winds; they thus reached this island, and afterwards steered a course for cape San Lucas.

Reed Rocks or Palmouth Shoal.—Captain Reed of the brig *Emma*, 1850, is said to have discovered two rocks in lat. $87^{\circ} 24' N.$, long. $187^{\circ} 27' W.$, lying N.E. and S.W.,—one 150 fathoms long and 66 fathoms wide, the other about 100 fathoms long and 88 fathoms wide; 3 and 5 fathoms water were found over them respectively, and in his opinion the sea would break over the rocks in heavy weather. The U.S. sloop-of-war *Falmouth* also saw them in 1851; the position given being the same as that originally reported by Captain Reed. In 1856 Captain Redfield of the whaler *Abigail*, saw some rocks with only 10 feet water over them, the largest 150 feet long by 50 feet broad; and saw a quarter of a mile S.S.E. of these discoloured water, indicating another and smaller patch; the position given being 11 miles farther north and 8' more westerly than that reported by Captain Reed, viz.,—lat. $87^{\circ} 35' N.$, long. $187^{\circ} 30' W.$ All the reports probably refer to the same danger, if it exists, which is doubtful, as several vessels have since passed over the locality without noticing any indication of danger.

In 1871 and again in 1878 the site of this reported shoal, between the parallels $87^{\circ} 15'$ and $87^{\circ} 38' N.$, and between the meridians $187^{\circ} 5'$ and $188^{\circ} 10' W.$, was examined by the U.S. Coast Surveyors without finding any shoal spots. Commander G. Bradford, of schooner *Marcy*, ran over 1000 miles, and determined 59 positions in the vicinity; soundings were frequently taken, but no bottom was found even with 1850 fathoms of line. Commander Johnson of the steamer *Hassler*, made 100 casts of the lead in the locality but without finding bottom in 2400 fathoms. The steamer ran 1400 miles during this examination.

APPENDIX.

WINDS ON THE WESTERN COAST OF AMERICA AND IN THE PACIFIC.

The following remarks on the winds which prevail in some parts of the Pacific, and on the North-western coast of America, are by Lieutenant James Wood, H.M.S. *Pandora*.* :—

"The prevailing winds of the Pacific, with the exception of those on the coasts of Chili and Peru, are little known. A few remarks, therefore, on those that obtain along the western coast of America, from the river Guayaquil to Vancouver island, as well as on the more regular and extended aerial currents which traverse the vast expanse of the open ocean, condensed from observations and information collected during a four years' cruise over the greater part of it, may not be destitute of interest and utility, especially as the northern portion is but little known, and promises, ere long, to become the theatre of an important trade between the coasts of China and the new and rich countries which American enterprise and energy are now so rapidly peopling and raising from obscurity on the coast of California.

The whole of this extensive line may be divided into three portions or zones :—

- 1.—The intertropical, which is more or less affected by the fine and rainy seasons.
- 2.—The dry and arid portion which extends from 28° to 32° north, where the winds blow with almost the regularity of a trade wind.
- 3.—The more variable northern coast, which is subject to greater vicissitudes of climate.

I. **The Intertropical.**—*Guayaquil River to Guascama Point.*—Along the whole of the coast from the river Guayaquil, in lat. 8° S., to Guascama point in lat. 2° N., the wind is mostly from south to west all the year round; the exceptions are few, and generally occur in the fine season. Both in beating up this coast to the southward, and in running down it, the former in the months of May and June, the latter in those of October, November, and January, we had the wind from S.S.E. to W. (by the south), with a constant current to the north-eastward, the only difference being that the winds were lighter, and the weather finer in May and June as we got to the southward; whilst the contrary took place in October and November; and in January the weather was generally fine, with moderate breezes.

Choco Bay.—After entering the bay of Choco, of which point Guascama forms the southern horn, the winds become more variable; but during the time we were in the bay (from the end of January to the middle of March) it never blew very fresh, though the weather was often unsettled and heavy rains frequent. The prevailing wind was from south-west, but north-westerly winds were not uncommon.

Chirambira Point to the Gulf of San Miguel.—When past Chirambira point (the northern horn of Choco bay) we had the wind more from the northward, and in the latter end of March had to beat up to Panama bay against north-westerly and north-easterly breezes, blowing a fresh breeze at times, especially as we approached the bay.

* See the *Nautical Magazine*, 1850.

In surveying this last named part, in January 1848, we found the winds more variable, heavy rains almost always accompanying a change to south-west, from which quarter we once or twice had a stiff breeze.

Gulf of San Miguel to the Gulf of Dulce, including the Bay of Panama.—Between the southern point of the Gulf of San Miguel and the gulf of Dulce, including Panama bay and the coast of Veragua, the winds are regulated by the seasons. Towards the end of December the "northers" begin to blow. These are fine, dry breezes which generally come on in the afternoon, and blow very fresh from N.N.E. to N.N.W. till near midnight, with a perfectly clear and cloudless sky, and the air so dry and rarefied, that objects on a level with the horizon are distorted and flattened, and the same effects are caused as are seen during an easterly breeze off our own coast. Though generally a double-reefed top-sail breeze, they occasionally blow much harder, especially off the coast of Veragua, where, in the months of January and February, even a close-reefed top-sail breeze is not uncommon. During even the strongest of these, a dead calm often prevails 10 or 15 miles off the land, the only evidence of the gale that is blowing within a few hundred yards of you being the agitation of the water, which is raised into short hollow waves, which break on board of and tumble you about considerably.

Towards the end of March up to the middle of April, the "northers" begin to cease, and are succeeded by calms and light sea and land breezes, with occasional squalls from the south-westward. As April advances the squalls get stronger and more frequent, and by the early part of May the rainy season generally sets in, during the greater part of which south and south-westerly winds prevail: these are not very violent within the bay of Panama; but from cape Mala, westward, gales from the above quarters are frequent, and sometimes severe, bringing a very heavy sea with them.

Gulf of Dulce to the Gulf of Fonseca.—From the Gulf of Dulce, proceeding westward along the shores of Costa Rica, Guatemala, and Mexico, we find the winds still follow the changes of the seasons, modified, however, by locality. For instance, whenever the "northers" prevail, we find them blowing off the shore at nearly right angles to the run of the coast; thus, as soon as the coast of Nicaragua is approached (which takes a more northerly direction than that before mentioned), we find, during the fine season, the "northers" exchanged for breezes called 'papagayos.' These blow from N.N.E. to E.N.E. or E., and are accompanied by the same clear fine weather as the 'northers'; the prevailing wind, however, during this season (from January to April) is from south-east to north-east. From May to November, which is the rainy season, the weather is mostly bad, gales from the west and south-west, with thunder, lightning, &c., being frequent and at times violent.

Gulf of Fonseca to the Gulf of Tehuantepec.—After passing the gulf of Fonseca, where the land again trends nearly due west, the northerly winds are lost, till on reaching the gulf of Tehuantepec we meet them once more, but under a different name, and assuming a more violent character. Along this portion where the mountains approach, and even in some places form the coast line, the winds during the fine season are the usual tropical land and sea breezes; the former from N.W., the latter from S. to W.S.W. and W. The remaining months are marked by even worse weather from the same quarters as is found on the Nicaragua coast.

Gulf of Tehuantepec to Tejupan Point.—The heavy blasts which blow over the isthmus of Tehuantepec, derive their source from the country they cross. They seem to be caused by the "northers" in the gulf of Mexico, which here find a vent through the opening formed between the Mexican and Guatemalan mountains. They blow with great force from North to N.N.E., and raise a very high short sea; their force is felt several hundred miles off the coast. During the season when they prevail (December to April) every preparation should be made to meet and carry sail through them: if this can be done they are soon crossed, and 200 to 250 miles of westing (or easting) made; otherwise, if you are obliged to heave to, 86 to 118 hours of heavy weather may be expected, exposed all the while to a very high and short sea. In the rainy season these cease; but the weather here, as along the whole coast of Mexico, is then very bad, gales and strong breezes from S.E. to S.W. constantly occur, whilst squalls accompanied by thunder and lightning, with heavy, and almost incessant rain, charac-

terise the season throughout. These gales are at times very severe, rendering the navigation of such a coast very unpleasant, as, with one exception, there is scarcely any shelter from them to be found. During the fine season, however, nothing can be more regular or quiet than the weather on the Mexican coast; a regular sea breeze sets in about noon, beginning from S.S.W. to W.S.W., and getting more westerly as the sun goes down, decreasing with it, and gradually sinking into a calm as the night closes in. This is succeeded by the land wind off the shore, which is more irregular in its direction and force, but these winds, and the method of making a passage to the westward, along the coast, have been so well, and so truly described by Dampier and Basil Hall, that nothing remains but to add my testimony to the correctness of the accounts they give, as far as the phenomena fell under my own observation.

As soon as the coast begins to trend northerly again, which it does about Tejuapan point, we meet the northerly winds which blow down the gulf of California, and which are found pretty steady during the fine season a few miles off the coast; by taking advantage of these, and the daily variations caused by the land and sea breezes, the passage is made from this point to San Blas and Mazatlan; but it is always a tedious beat, owing to a contrary current and frequent calms.

II. Second Portion or Division.—*Cape San Lucas to San Diego.*—From cape San Lucas to San Diego, or from 23° to 32° N., the general direction of the wind is from west to north, but during the winter months, or from November to April, this coast is subject to violent gales from the S.E., which, as most of the bays and anchorages are open toward that quarter, are much dreaded. This is especially the case along the northern portion of this division, as towards cape San Lucas they are less frequent; however, they always give ample warning of their approach. The only way, therefore, of making a passage up this coast, is by standing off upon the starboard tack—as you get out, the wind draws to the eastward—till either the variables are reached, or you can fetch your port on the other tack. In the summer season the only alteration is that the wind is more westerly in the mornings, and draws round with the sun as the day advances.

III. Third Division.—*San Diego to San Francisco.*—From San Diego to San Francisco the wind prevails from the north-westward nearly all the year round. This coast is subject to the same south-easterly gales as the coast of Lower California, but they are more frequent here, and blow with greater force. All the bays and roadsteads are similarly exposed with the exception of the above named ports, which are perfectly secure and defended from all winds. During the winter, therefore, vessels always anchor in a convenient berth for slipping, with springs and buoys on their cables, so that on the first appearance of heavy clouds approaching from the south-east, with a heavy swell rolling up from the same quarter (the invariable signs of the coming gale), they may be able to slip and go to sea without loss of time. These gales last from 12 hours to two days, and are accompanied by heavy rain, which lasts till the wind changes, which it often does very suddenly, and blows as hard for a few hours from the north-west, when the clouds clear off and fine weather again succeeds. Off point Concepcion gales and strong breezes are so frequent as to obtain for it the appellation of the cape Horn of California. They are mostly from north to west, and frequently blow with great force, especially in the winter, when they sometimes last for three days together, without a cloud to be seen, till they begin to moderate. But here one of the most remarkable features of this coast first shows itself, viz., the frequent and dense fogs, which, during more than half the year, render the navigation from San Diego northward most unpleasant. In making the land, the only way to deal with them, is to feel your way into the coast with the lead during the day-time, as it frequently happens that a thick fog prevails at sea, while, at the same time, within a mile or two of the land, a beautiful clear bright sky, and open horizon are to be found: if disappointed in this, you have but to wear, haul off again, and heave to till the desired change does take place.

San Francisco to Vancouver Island.—From San Francisco northward to the strait of Juan de Fuca, the north-westerly are still the prevailing winds; in the months of June, September, and October, we found them almost constantly so; hard gales from all points of the compass, however, may be looked for here at all seasons, especially

during the winter, and the equinoctial months. These begin generally from S.E. to S.W., bringing thick rainy weather with them. After blowing from these quarters for some hours, they fly round to the northward (by the west), with little if any warning, except the increased heaviness of the rain, and blow even harder than before. During the spring, easterly and north-westerly breezes are more prevalent than at other seasons. In the summer months, westerly winds and fine weather prevail, but from the end of July to the end of August the fogs are so frequent that many weeks will sometimes pass without a clear day.

Method of Making Passages within the 1st Division.—From the southward to Panama Bay.—From what has been said respecting the winds which prevail within the first division, it will be seen that the passage from the southward to Panama bay is easily made during the greater part of the year; but in the fine season, when within the influence of the "northers", the following plan should be adopted. Make short tacks in-shore, as there is generally a set to the northward found within a few miles of the land, and where that is interrupted, a regular tide is exchanged for a constant current farther off. Between Chirambira point and cape Corrientes the land is low and faced with shoals, caused by the mouths of the numerous rivers which have their outlets on this part of the coast, but after passing cape Corrientes, it may be approached pretty closely, except off Solano point, where some shoal rocky patches extend to seaward, as the coast is in general bold-to. Care, however, should be taken not to run into the calms caused by the high lands, as it is difficult to get off into the breeze again, and the swell sets in-shore where it frequently happens that no anchorage is to be found till close to the rocks.

In beating up the bay of Panama, in the fine season, the eastern passage, or that between the Perlas islands and the main is to be preferred, as, with one exception, it is free from dangers. The water is smooth, and a regular tide enables you to make more northing than it would be possible to do in nine cases out of ten against the strong current and short high sea which at this season prevail in the centre or on the western side. During the rainy season a straight course up the bay is preferable to entangling yourself with the islands, the current generally following the direction of the wind.

Panama Bay to the Southward.—But the great difficulty, at all times, consists in getting either to the southward or westward of Panama. The passage to the southward is made in two ways,—either by beating up the coast against a constantly foul wind and contrary current, or by standing off to sea till sufficient southing is made to allow you to fetch your port on the starboard tack. Both plans are very tedious, as it frequently takes twenty days to beat up to Guayaquil, whilst six or seven days are an average passage down.

Panama Bay to the Westward.—If bound to the westward during the "northers," a great deal of time may be saved by keeping close in-shore, and thus taking advantage of them; they will carry you as far as the gulf of Nicoya. When past the Morro Hermoso, 'papagayos' may be looked for, and with them a course should be steered for the gulf of Tehuantepec, and it will then depend on the port you are bound to, whether, after crossing the gulf by the aid of one of its gales, you should keep in or off shore. If bound for Acapulco, keep in, and beat up; but if bound to the westward, you cannot do better than make a west course, as nearly all the winds will allow you: but as the in-shore winds are now under discussion, we will leave the consideration of the best means of reaching the trade winds for a future occasion.

The passage to the westward of Panama, during the rainy season, is a most tedious affair,—calms, squalls, contrary winds, and currents, accompanied by a heavy swell, and extreme heat, as well as an atmosphere loaded with moisture and rain, are the daily accompaniments. It often occurs that 20 miles of westing are not made in a week, and it is only by the industrious use of every squall and slant of wind, that the passage can be made at all. Opinions are divided amongst the coasters as to the propriety of working to the southward and trying to get rid of the bad weather, or beating up within a moderate distance of the land. My experience would lead me to prefer the latter, as the strong winds and frequent squalls which so often occur near the land, sometimes allow a long leg to be made to the north-westward, while, farther off, this advantage is sacrificed for only a shade finer weather.

General Observations respecting the Off-shore Winds.—With respect to the winds which prevail in the open ocean, the same general rules obtain in the Pacific, as are recognised throughout the rest of the globe, *i.e.*, a north-eastern trade within the limits of the northern tropic, and a south-eastern within the southern; also as to the prevalence of westerly winds when either to the northward or southward of those boundaries. There are, however, exceptions to these rules. Within the tropics, wherever large groups of islands are found, the trades are subject to great variations both in direction and force. Also to the northward of the tropic of Cancer, when bound from the Sandwich islands for the American coast, there are many instances, during the spring and summer, of 45° or even 50° of north latitude being reached, before a westerly wind could be obtained.

Galapagos Islands to Cape San Lucas.—I have already alluded to the difficulty of getting to the westward from the bay of Panama. The trade wind seems to possess no steady influence to the eastward of a line drawn from cape San Lucas, in 28° N., to the Galapagos islands on the equator. Amongst these islands the south-eastern trade wind is steady during nine or ten months of the year, and it is only in January and February, and sometimes March, that they are interrupted by long calms, and occasional breezes north and north-west, but these are never of any strength. To the northward of them, the eastern limit of the trade seems to depend upon the time of the year. In the early part of April, I have found it between the parallels of 8° and 18° North, 900 to 1000 miles farther to the eastward than at the end of June; and in the intermediate months, either more or less to the eastward as it was earlier or later in the season, but in no case that I have met with has a steady or regular trade been experienced till the above line has been reached. It is this circumstance, and the prevalence in the intermediate space of westerly winds, calms, and contrary currents, that makes the passage from Panama to the westward, as far as this line, so tedious. I have been 40 days beating from the entrance of the bay, in 80° W., to the eastern edge of the trade, in 111° W., a distance of less than 2000 miles, or, on an average, about 40 miles per day.

From the Meridian of Cape San Lucas, Westward.—When once within the influence of the trades, a passage is easily made either to southward, westward, or northward; but it must be borne in mind that the eastern verge of this trade seems, in these parts, to be influenced by the seasons. Thus in June and July, I found it fresh from N.N.W., and even at times N.W., as far out as the meridian of 125° W., whereas in March and April it was light from N.N.E. to E. and E.S.E. from our first meeting it in 98° W. till past the meridian of cape San Lucas in 110° W., where I picked up a good steady breeze from N.N.E.

As a general rule the wind is found to haul more to the eastward as you get farther off the land, and I did not find this rule affected by the latitude, as, although, as I have stated, the wind hangs to the northward, and even at times to the westward of north, near the eastern limit of the trade, from the tropic of Cancer to the variables near the equator, I found it about the meridian of the Sandwich islands, as far to the eastward on and near the line as it was in 35° north, in which latitude the westerly winds are in general met with.

From the Sandwich Islands to the Northward and Eastward.—The passages, therefore, from the Sandwich islands to any part on the north-west coast of America, are made by standing to the northward till the westerly winds are reached, when the run into the coast is easily made, taking care, however, if bound to a port to the southward of you, not to bear up till well in with the land, when, as I have said, north-westerly winds will be found to carry you down to the southward.

On this coast, as a general rule, the land should always be made to the northward of the port you are bound to, as in almost all cases the wind and current both prevail from the northward from Vancouver island to cape Corrientes of Mexico.

Though lying between the parallels of 19° and 28° north, the Sandwich islands are often visited during the winter months with strong breezes and gales from south and south-west, but for the rest of the year the trade-wind blows pretty steadily. In making a passage thence to the coast of Chili or Peru, the best way is to stand across the trade as near the wind as the top-mast-studding-sail will stand. This, as the

direction of the wind is in general from E.N.E. to E., will enable you to make Tahiti, and pass the Society islands by one of the clear channels to the westward of it. It is of little use trying to fetch to the eastward of these, as not only do you loose much time by hugging the wind too close, but also the strong current which sets to the westward, from 20 to 40 miles a day, is pretty sure to drift you that much to leeward; and even were this not the case, so difficult, tedious, and dangerous is the navigation amongst the archipelago of low coral islands which lies to the eastward, that unless you can weather the Marquesas altogether, it is better even to bear up, than to entangle yourself in such a labyrinth. After passing the Society islands, stand on to the southward, till, in or about the 80th parallel, the westerly winds will be found. These will carry you into the coast; care being taken, as on the northern coast, not to bear up when within the influence of the southerly winds, till near enough to the land to ensure keeping them down to your port.

Trade Winds Affected by Groups of Islands.—I have before stated, when once within the influence of these island groups, the trade winds are found to be subject to great alterations and deflections, or lost altogether. This is especially the case during the time the sun is to the southward of the equator amongst those in the southern hemisphere. West and south-west, as well as north-west winds are then often experienced, and amongst the far western groups, heavy gales almost amounting to hurricanes are experienced, when from their latitude they should be in the very centre of the trade winds. As a proof of this deviation from the usual course of the trade when near large groups of islands, I may mention, that, when making the passage from the Sandwich to the Society islands, in June 1840, I had the wind nearly east all the way to the parallel of the Marquesas (10° S.), when it came from the south-eastward; but I left Tahiti at the same month for Valparaiso with a north-westerly wind, though this island is situated in 17° S. This carried me 500 miles to the westward, nor did I again meet the trade, though the usual boundary (the parallel of 30° S.) was not passed till I had sailed with (for the most part) a fair wind, upwards of 2000 miles to the eastward.

From the time I left Pitcairn island (18th July) to within 100 miles of the American coast, a distance of more than 8000 miles, I experienced strong winds, and sometimes gales from south round by west to north-west, only one day's interval; this being, from all accounts, the general character of winds in these latitudes."

The following remarks are from the *Mercantile Marine Magazine*, 1859, "In the year 1855, in connection with the U.S. Survey of the Pacific coast, observations were made on the character of the winds of the Western coast of the United States, at three permanent stations, viz:—

Astoria, Oregon	lat. 46° 11' N.	long. 128° 49' W.
San Francisco, California	" 37 48	" 122 28
San Diego	" 32 40	" 117 12

The directions of the wind were noted in points, and the observations taken three times each day, at 6 A.M., at noon, and at 6 P.M., except on Monday in each week, when hourly observations were made. From these, the following general characteristics may be said to predominate:—

1. The great prevalence of westerly winds, representing a flow of the air at the surface from the ocean in upon the land.
2. The general absence of easterly winds, showing the absence of a return current at the surface.

The proportion of westerly to easterly winds is as 8 to 1.

3. The increase of westerly winds in the summer, and their decrease in the winter.
4. That when easterly winds blow at all, it is as a rule during the winter.
5. The N. N.E., and E. winds blow more frequently in the morning than in the afternoon hours.
6. The S.E., S., and S.W. winds, are in general pretty equally distributed over the morning and evening hours.
7. The N.W. is the prevailing direction of the ordinary sea breeze at Astoria and San Diego, and the W. at San Francisco.

Sometimes the W. wind has that character at the first named stations, and sometimes the S.W. wind at the last named.

As some of the details connected with these observations will be of service to our nautical readers, they are here furnished.

San Francisco.—At San Francisco the great current of air flowing from the sea to the land comes generally from the W. or S.W., rarely from the N.W.

In the period from November to March, inclusive, the W. is the prevailing wind, exceeding in quantity both the others, the S.W. wind exceeding in quantity the N.W. In the period from April to October, the W. and S.W. winds are nearly equal, and each exceeds the N.W.

The W. wind has, in general, the features attributed to the sea breeze, beginning after the rising of the sun, increasing until after the hottest part of the day, and dying out or much diminishing at nightfall.

The W. and S.W. winds are prominent features at San Francisco.

The S.W. is the prevailing wind in June and July; S.W. and W. winds blowing nearly the whole of those months, not succeeded by an easterly land breeze—but rising and falling. May and August resemble each other, the N.W. and S.W. winds being nearly equal in quantity, and each less than the W. wind. In April and September the N.W. wind has nearly died out. The W. wind diminishes in quantity through March and February, and through October, November, and December, to January. The N.W. wind increases again from April towards December, and is very small in October and November. The S.W. wind disappears in October, reappearing in November and December, and increasing towards January. The W. wind has a maximum in April and May, and another in September and October, the minima being July and January.

The N. wind in December, January, and February, reaching a maximum in January, is the only other point to be noticed for San Francisco, partaking with the other places in the general absence of easterly winds, although these show themselves slightly in winter. There is also but little S. wind.

Astoria and San Diego.—In general, the winds at these two places resemble each other more than those at San Francisco do either. April, May, June, July and August have the same general character.

The N.W. wind is the summer wind and has the characteristics of the sea breeze, but there is no return land breeze. The N.W. wind reaches a maximum in July, and a minimum in December. It is the great prevailing wind of the year at San Diego. As it decreases it is generally replaced by W. and S.W. winds of less quantity. In December the quantities of the three winds are nearly equal.

The resemblance of these winds at San Diego and Astoria is remarkable, the remarks just made applying generally to both places. There is, however, much less N.W. wind at Astoria than at San Diego. Except in June, July and August, there is some S. wind each month at Astoria, and especially from September through October, November, December and February. At San Diego this is less marked, the two agreeing most nearly in quantity in March, April and May.

The S.E. wind is a distinct feature in both places in February and March, and at San Diego in April and June.

The E. wind is prominent at Astoria in January, February and March, and the N.E. from October to January, inclusive.

Astoria has the most easterly wind, the N.E. beginning in October and blowing until February, and being replaced by the E. wind in March.

The summer is the windy season on the West coast,—July being one of the windiest months of the year."

The following general remarks are by Captain Basil Hall, R.N., "On the south-west coast of Mexico, the fair season, or what is called the summer, though the latitude be north, is from December to May inclusive. During this interval alone it is advisable to navigate the coast; for, in the winter, from June to November inclusive, every part of it is liable to hard gales, tornadoes, or heavy squalls, to calms, to constant deluges of rain, and the most dangerous lightning; added to which, almost all parts of the

coasts are, at this time, so unhealthy as to be abandoned by the inhabitants. At the eastern end of this range of coast, about Panama, the winter sets in earlier than at San Blas, which lies at the western end. Rains and sickness are looked for early in March at Panama; but at San Blas rain seldom falls before the 15th of June; sometimes, however, it begins on the 1st of June, as we experienced. Of the intermediate coast I have no exact information, except that December, January, and February are fine months everywhere; and that, with respect to the range between Acapulco and Panama, the months of March, April, and half of May, are also fine; at other times the coast navigation may be generally described as dangerous, and on every account to be avoided.

From December to May inclusive, the prevalent winds between Panama and cape Blanco (gulf of Nicoya) are N.W. and northerly. Thence to Realejo and Sonsonate, N.E. and easterly. At this season, off the gulfs of Papagayo and Tehuantepec there blow hard gales, the first being generally N.E., and the latter N. These, if not too strong, as they sometimes are, greatly accelerate the passages to the westward; they last for several days together, with a clear sky overhead, and a dense red haze near the horizon. We experienced both in the *Conway* in February, 1822. The first, which was off the gulf of Papagayo on the 12th, carried us 280 miles to the W.N.W.; but the gale we met in crossing the gulf of Tehuantepec on the 24th, 25th, and 26th, was so hard that we could show no sail, and were drifted off to the S.S.W. more than 100 miles. A ship ought to be well prepared on these occasions, for the gale is not only severe, but the sea, which rises quickly, is uncommonly high and short, so as to strain a ship exceedingly.

From Acapulco to San Blas, what are called land and sea breezes blow; but, as far as my experience goes, during the whole of March, they scarcely deserve that name. They are described as blowing from N.W. and W. during the day, and from N.E. at night; whence it might be inferred, that a shift of wind, amounting to eight points, takes place between the day and night breezes. But, during the whole distance between Acapulco and San Blas, together with about 100 miles east of Acapulco, which we worked along, hank for hank, we never found, or very rarely, that a greater shift could be reckoned on than four points. With this, however, and the greatest diligence, a daily progress of from 80 to 50 miles may be made.

Such being the general state of the winds on this coast, it is necessary to attend to the following directions for making a passage from the eastward:—

On leaving Panama for Realejo or Sonsonate, come out direct to the north-westward of the Perlas islands; keep from 20 to 30 leagues off the shore as far as cape Blanco (gulf of Nicoya); and on this passage advantage must be taken of every shift of wind to get to the north-westward. From cape Blanco hug the shore, in order to take advantage of the north-easterly winds which prevail close-in. If a *papagayo* (as the strong breeze out of that gulf is called) be met with, the passage to Sonsonate becomes very short.

From Sonsonate to Acapulco, keep at the distance of 20, or, at most, 30 leagues from the coast. We met with very strong currents running to the eastward at this part of the passage; but whether by keeping farther in, or farther out, we should have avoided them, I am unable to say. The above direction is that usually held to be the best by the old coasters.

If, when off the gulf of Tehuantepec, any of the hard breezes, which go by that name, should come off, it is advisable, if sail can be carried, to ease the sheets off, and run well to the westward, without seeking to make nothing; waiting being, at all stages of that passage, by far the most difficult to accomplish. On approaching Acapulco, the shore should be got hold of, and the land and sea breezes turned to account.

This passage in summer is to be made by taking advantage of the difference in direction between the winds in the night and the winds in the day. During some months, the land winds, it is said, come more off the land than at others, and that the sea breezes blow more directly on shore; but in March we seldom found a greater difference than four points; and, to profit essentially by this small change, constant vigilance and activity are indispensable. The sea breeze sets in, with very little variation as to time, about noon, or a little before, and blows with more or less strength,

till the evening. It was usually freshest at two o'clock; gradually fell after four; and died away as the sun went down. The land breeze was by no means so regular as to its periods or its force. Sometimes it came off in the first watch, but rarely before midnight, and often not till the morning, and was then generally light and uncertain. The principal point to be attended to in this navigation is, to have the ship so placed at the setting in of the sea breeze, that she shall be able to make use of the whole of it on the port tack, before closing too much with the land. If this be accomplished, which a little experience of the periods renders easy, the ship will be near the shore just as the sea breeze has ended, and there she will remain in the best situation to profit by the land wind when it comes; for it not only comes off earlier to a ship near the coast, but is stronger, and may always be taken advantage of to carry the ship off to the sea breeze station before noon of the next day.

These are the best directions for navigating on this coast which I have been able to procure; they are drawn from various sources, and, whenever it was possible, modified by personal experience. I am chiefly indebted to Don Manuel Luzurragai, master attendant of Guayaquil, for the information they contain. In his opinion, were it required to make a passage from Panama to San Blas, without touching at any intermediate port, the best way would be to stretch well out, pass to the southward of Cocos island, and then run with the southerly winds as far west as 96° before hauling up for San Blas, so as to make a fair wind of the westerly breezes which belong to the coast. An experienced old pilot, however, whom I met at Panama, disapproved of this, and said, the best distance was 15 or 20 leagues all the way. In the winter months these passages are very unpleasant, and it is indispensable that the whole navigation be much farther off shore, excepting only between Acapulco and San Blas, when a distance of 10 to 12 leagues will be sufficient.

The return passages from the west are always much easier. In the period called here the summer, from December to May, a distance of 80 to 50 leagues ensures a fair wind all the way. In winter, it is advisable to keep still farther off, say 100 leagues, to avoid the calms, and the incessant rains, squalls, and lightnings, which everywhere prevail on the coast at this season. Don Manuel Luzurragai advises, during winter, that all ports on this coast should be made to the southward and eastward, as the currents in this time of the year set from that quarter.

If it were required to return direct from San Blas to Lima, a course must be shaped so as to pass between the island of Cocos and the Galapagos, and to the south-eastward, till the land be made a little to the southward of the equator, between cape Lorenzo and cape St. Helena. From thence work along shore as far as point Aguja, in lat. 6° S., after which work due S., on the meridian of that point, as far as $11\frac{1}{2}^{\circ}$ S., and then stretch in-shore. If the outer passage were to be attempted from San Blas, it would be necessary to run to 25° or 30° S. across the trade, which would be a needless waste of distance and time.

Such general observations as the foregoing, on a navigation still imperfectly known, are perhaps better calculated to be useful to a stranger than detailed accounts of passages made at particular seasons. For, although the success of a passage will principally depend on the navigator's own vigilance in watching for exceptions to the common rules, and on his skill and activity in profiting by them, yet he must always be materially aided by a knowledge of the prevalent winds and weather. As many persons, however, attach a certain degree of value to actual observations made on coasts little frequented, although the period in which they may have been made be limited; I have given in the two following notices, a brief abstract of the *Conway's* passages from Panama to Acapulco, and from Acapulco to San Blas. The original notes from whence they are taken are too minute to interest any person not actually proceeding to that quarter of the world.

*Panama to Acapulco (5th of February to 7th of March, 1822—80 days).—*We sailed from Panama on the 4th of February, and anchored on that afternoon at the island of Taboga, where we filled up our water. Next evening, the 5th, we ran out of the bay with a fresh N.N.W. wind, and, at half-past two in the morning of the 6th, rounded cape Mala, and hauled to the westward. As the day advanced, the breeze slackened, and drew to the southward. In 24 hours, however, we had run 140 miles,

and were entirely clear of the bight of Panama. It cost us nearly 6 days more before we came abreast of cape Blanco (gulf of Nicoya); at first we had light winds from S.S.W., then a moderate breeze from N.N.W., which backed round to the eastward, and was followed by a calm: during each day we had the wind from almost every point of the compass, but light and uncertain. Between the 11th and 12th, we passed cape Blanco, with a fresh breeze from S.S.E. and then S.S.W., which shifted suddenly to the northward, afterwards to the N.N.E., where it blew fresh for upwards of 24 hours, and enabled us to run more than 280 miles to the W.N.W. in one day. This breeze, which is known by the name of *papayayo*, failed us after passing the gulf of the same name, and we then came within the influence of adverse currents. On reaching the longitude of 92° W., on the 16th, we were set S. 16° W., 77 miles; on the 17th, N. 16 miles; on the 18th, E. 51 miles; on the 19th, S. 78° E., 68 miles; on the 20th, S. 62° E., 45 miles; on the 21st, S. 87° E., $17\frac{1}{2}$ miles; all of which we experienced between 91° and 93° W., at the distance of 20 or 30 leagues from the shore; meanwhile we had N.N.E. and northerly winds, and calms.

After these currents slackened, we made westing as far as $98\frac{1}{2}^{\circ}$, by help of N.N.E. and easterly winds. On the 22nd, 23rd, and 24th, we were struggling against north-westerly winds off Guatemala, between 14° and $15\frac{1}{2}^{\circ}$ N. latitude. This brought us up to the top of the bay of Tehuantepec at sunset of the 24th; we then tacked and stood to the westward. The weather at this time looked threatening; the sky was clear overhead, but all around the horizon there hung a fiery and portentous haze, and the sun set in great splendour; presently the breeze freshened, and came to the north by west, and before midnight it blew a hard gale of wind from north. This lasted, with little intermission, till six in the morning of the 26th, or about 80 hours. There was, during all the time, an uncommonly high short sea, which made the ship extremely uneasy. The barometer fell from 29.94 to 29.81, between noon and 4 o'clock, p.m., but rose again as the gale freshened; the sympiesometer fell twelve-hundredths. This gale drove us to the S.W. by S., about 140 miles. A fine fresh breeze succeeded from N.N.E., which carried us 120 miles towards Acapulco, and left us in longitude $97\frac{1}{2}^{\circ}$ W. and latitude 15° N., on the 27th. This was the last fair wind we had on the coast; all the rest of our passage, as far as San Blas, being made by dead beating. The distance from Acapulco was now less than 180 miles, but it cost us 8 days' hard work to reach it, principally owing to a steady drain of lee-current running E. by S., at the following daily rates, viz., 18, 16, 27, 87, 25, 10, 9, 7, and 9 miles. The winds were, meanwhile, from N.W. to N.N.W., with an occasional spurt from S.E. and S., and several calms. We had not yet learned the most effectual method of taking advantage of the small variation between the day and night winds.

Acapulco to San Blas (12th to 28th of March, 1822—16 days).—This passage was considered good for the month of March, but in the latter days of December, and 1st of January, an English merchant made it in 10 days, having a fair wind off shore nearly all the way. A merchant brig, which passed Acapulco on the 6th of February, at the distance of 150 miles, was a fortnight in reaching cape Corrientes, and nearly 8 weeks afterwards getting from thence to San Blas, a distance of only 70 miles. There is, however, reason to believe that the vessel was badly handled.

It would be useless to give any more detailed account of this passage than there will be seen in the preceding remarks. We generally got the sea breeze about noon, with which we laid up for a short time W.N.W., and then broke off to N.W., and so to the northward, towards the end of the breeze, as we approached the coast. We generally stood in within a couple of miles, and sometimes nearer, and sounded in from 15 to 25 fathoms. If the breeze continued after sunset, we made short tacks, in order to preserve our vicinity to the land, to be ready for the night wind. With this we generally lay off S.W., sometimes W.S.W. and W., but only for a short time. After passing latitude 18° , the coast trended more to the northward, and a much larger leg was made on the port tack, before we were obliged to go about. As we approached cape Corrientes, in latitude 20° , the land winds became more northerly, and the sea breezes more westerly: so that, as the coast also trended off to the northward, a more rapid advance was made.

During our stay at San Blas, from the 28th of March to the 15th of June, we had

light land-winds every night, and a moderately fresh breeze from west every day, with the thermometer always above 80°.

Towards the end of the period, the sky, which had been heretofore clear, became overcast; the weather lost its former serene character, becoming dark and unsettled; and, on the 1st of June, the periodical rains set in with great violence, accompanied by thunder and lightning, and fresh winds from due south. This was nearly a fortnight earlier than the average period. The heat and closeness of the weather increased greatly after the rains set in; but although our men were much exposed, no sickness ensued, excepting a few cases of highly inflammatory fever. The town was almost completely deserted when we came away; the inhabitants having, as usual, fled to Tepic and other inland towns, to avoid the discomfort and sickness which accompany the rains.

As soon as the rains subside, in the latter end of October, or beginning of November, the people return, although that is the period described as being most unhealthy, when the ground is still moist, and the heat of the sun not materially abated."

The remarks that follow are by Commander C. B. Hamilton, R.N.*

"The west coast of Mexico is considered highly dangerous in the bad season, viz., from June to 5th November, and all the vessels obliged to remain in the neighbourhood lie up, either in the secure harbour of Guaymas, at Pichilique, or in the bay of La Paz, all in the gulf of California.

The hurricanes that occasionally visit this coast are so much dreaded, that in the months of July, August, September, and October, the ports are deserted, and trade ceases. I believe the *Frolic* is the first vessel of any nation, whether men-of-war or merchant-ship, that ever remained the whole bad season on the coast,—and, that off the two most dangerous ports, viz., San Blas and Mazatlan. I shall therefore give all the information I can, relative to the bad season.

The hurricane so much dreaded on this coast is called the *Cordonazo de San Francisco*, a name given by the Spaniards on account of the hurricane prevailing about the time of San Francisco's day, the 4th of October, the word *cordonazo* signifying a heavy lash with a rope or whip; but from my own experience, and all I can learn, these *cordonazos* may be expected any time from the middle of June to the 5th of November; the worst ones that have been experienced of late years having occurred on the 1st of November, although the weather usually clears up about the 20th of October, and sometimes even sooner; and as soon as the weather does begin to clear up, a ship may, with common precautions, venture into the anchorages again, for this reason,—as soon as the weather has cleared up, the change in the appearance of the sky and weather will give ample warning of a coming hurricane, whereas, in the previous four months before the weather has cleared up, the thing that adds to the danger of this coast is, that owing to the threatening appearance of the sky every evening, and the violent thunderstorms and squalls at night, accompanied by heavy rain and lightning, the wind veering about, you are first led to believe that the hurricane is coming every night, and latterly you see it is utterly hopeless to foresee the coming of it, as, every night, appearances were as bad as they could be; the barometer here being of little or no use, and a tremendous sea occasionally setting in. Thus the remaining off this coast during the hurricane season will cause great anxiety.

The squalls and gales usually commence about S.E., and quickly fly round to the southward and S.W.: you have generally time to get to sea when it commences at S.E.; but, as I have before shown, you must go to sea every night, if you can, if you would be free from the danger of the *cordonazos* coming on. But a tremendous swell frequently sets in whilst the weather is in this threatening state, and the wind still light, which makes it impossible to get out. Moreover, if our boats happened to be out and on shore when the swell came, it was impossible to hoist them in; and for this reason we have frequently been obliged to send our boats from the ship, with their crews, to be hauled up on shore, and remain there until the swell went down, that I might be ready to slip and go to sea.

* See the *Nautical Magazine*, 1849.

It appears that the *cordonazos* come on an average once in 6 or 8 years, and we experienced none during our stay, although we had a gale on the night of the 21st of September. I was fortunately under way, and had plenty of room when it came on, having stood out to sea on the evening of the 19th, on account of the weather being bad, and fearing the full of the moon on the 20th.

It commenced about 9h. 30m. p.m., from S.E., flying round to S.W.; heavy rain, thunder, and lightning, with a very heavy sea, reducing us to close reefed main-topsail, and fore-staysail, washing away a boat, and obliging us to batten down. The squalls came on very suddenly, the prevailing winds being in the bad season from S.E. to S. and S.W., and the heavy swell usually before and after the full and change of the moon. The swell is such as is seen in the bay of Biscay in a heavy gale, and unfortunately usually sets into the bays before the wind comes.

I therefore think that a ship caught at anchor off San Blas or Mazatlan by a *cordonazo*, would have small chance of escape, especially off the former, as she would either go on shore or go down at her anchors; to slip and stand out the instant it commences from S.E. is her best course.

The range of the thermometer for June was 77° to 86°; July, 80° to 87°; August, 81° to 89°; September, 88° to 92°; October, 88° to 90°.

The barometer appeared to be of little service, usually remaining at 30 inches; seldom varying above a tenth, except during a heavy squall, when it rose considerably.

Our anchorage off San Blas during the bad season was usually in 12½ fathoms, soft mud,—Piedra del Mar, N. 58° W.; Piedra de Tierra just open southward of the bluff to the southward of San Blas river, N. 47° E.; point off wateringplace, N. 72° E.

Off Mazatlan, during the same season, in 28 fathoms, soft mud; centre of Creston isle, N. 13° E.; north-west extreme of North Venado isle, N. 28° W.; southernmost rock on south side of Mazatlan, N. 80° E.; small black rock nearly covered, N. 28° E.

I should not recommend a ship to lay closer than this, which is the best berth to get out from, in case of bad weather.

Excellent biscuit can be procured at Guaymas, at a very moderate price; and a most superior spirit, not inferior to the best whiskey, called Tequella Mascal, can be procured in any quantity at San Blas, at a very reasonable price, by applying to the consul at Tepic.

After the 4th of November the coasting and other vessels again make their appearance on the west coast of Mexico. San Blas is very sickly during the bad season. Guaymas is healthy, although the thermometer stands there at the astonishing height of 106° in July, August, and September, and owing to the extreme dryness of the atmosphere, ships receive much injury, by the wood opening. Furniture, apparently well seasoned, there cracks and falls in pieces.

On this coast there are some immense fish of the ray species. I caught one of them, and with difficulty hoisted one on board; it measured 19 feet in breadth across the back, the mouth was 3 feet 5 inches wide, and the flesh was 3 feet 6 inches deep in the centre. I had no means of ascertaining the weight, but found I could not lift it with the yard tackles and 60 men, it requiring 180 men, with the heaviest purchases in the ship, to hoist it in.

These fish are common on the west coast of Mexico and Gulf of California, where they are more dreaded by the pearl divers than sharks, or any other fish."

GENERAL REMARKS ON PASSAGES TO VARIOUS PORTS &c. &c.

The following general sailing directions for the coast of California are by Commander W. P. MacArthur, U.S. Navy (1850).

"From March to October the prevailing wind along the coast, and for many miles to the westward, is fresh from the north-west, being freshest from 10h. a.m. to 2h. p.m., and not unfrequently falling light during the night. During this season of the year, the north-west wind blows with almost the regularity of a trade-wind. During the months of August and September, fogs prevail to a great extent, and impede and endanger navigation materially.

During the greater part of the year above-mentioned, there were no heavy gales of wind and little or no rain.

These winds cause a current of about half a knot per hour along the coast, setting to the southward.

From October to March the wind is variable, both with regard to velocity and duration. During this season heavy gales occur from the south-east, south, and south-west, generally accompanied by protracted rain, and causing a very heavy sea and swell along the coast.

The current during this season sets generally to the northward, varying in velocity with the strength of the wind.

These facts being known, it is now to be considered how directions should be given which would be most useful to navigation.

Sailing vessels bound to the northward from Monterey, or any more northern port during the summer season, should stand well off-shore, not too close hauled until, about 200 miles from the land, when they will be beyond the influence of the southerly current, and in a situation to take advantage of a slant of wind, which frequently occurs from the W.N.W. They would do well not to approach the land, unless favoured by the winds so as to enable them to lay their course, or nearly so, until up with the latitude of the destined port.

Steamers should follow the coast from point to point as nearly as possible, always keeping within 15 miles of the land. They will by this means shorten the distance, and frequently avoid the strong north-west wind, as they will often find it quite calm close in with the shore, when there is a wind to seaward.

Vessels bound to the northward in the winter season should keep as close along the land as practicable, and take every advantage of all southerly winds to make latitude. They should always endeavour to make the land at least 20 or 30 miles to the southward of the destined harbour.

If bound to the southward keep the coast in sight, and take advantage of either tack upon which the most latitude may be made, always making the land to the northward of the port in summer, and to the southward in the winter season.

Bound to San Francisco or Monterey, use every opportunity to observe for latitude and longitude, so as to know the vessel's position up to the latest moment, as fogs and haze, preventing observations, prevail near the land. Allow generally for a southerly set of half a mile per hour, until within about 50 miles of land; after which, at times, it is not appreciable. With these precautions vessels may steer boldly on, shaping a course for the South Farallon, an islet about 250 feet high and a mile long, having 14 fathoms water, and good holding-ground on the S.E. side.

On approaching soundings the water becomes of a pale green colour. Soundings may be had in 60 to 40 fathoms, soft ooze, if approaching point Reyes. Below 40 fathoms is near the land, and the surf should be heard, if haze prevents the land from being seen. If the soundings are 30 fathoms or under, and the sea smooth, anchor with a kedge until the land becomes visible, so as to take a compass bearing, as the position cannot otherwise be relied on.

If up with the South Farallon and night approaching, or there are appearances of fog, anchor at the Farallon and wait till daylight, when the morning breeze will carry the vessel to the bar, or pilot-ground.

Note—Notwithstanding the remarks as to the general fact of the winds prevailing in the N.W. and N.N.W., quarter during the summer, it is proper to state that, in the month of June, 1850, the winds to the northward of San Francisco were light from the southward and westward, with showers north of Mendocino for the whole month, and the coasters ran to the northward with all steering sails.

It is, however, yet to be demonstrated whether June is a regular period of southerly breezes."

The following is by Mr. Masters, a gentleman in the Merchant service, who was for some time engaged in trade on the west coast of Mexico, (1830.) "On the whole coast of Mexico (on its Pacific side), from June to November, the weather is very tempestuous, with rain, thunder, and lightning, and in many parts of it this season is also very sickly. On the coast of Oajaca, and in the gulf of Tehuantepec, the rainy season generally commences about the end of April or the beginning of May, from

which time the roadsteads are very unsafe, until the bad weather breaks up, which is in December, and on the sea of Guadalajara and Sonora in November.

The dry season is generally fine, the sky generally clear, and the winds moderate, and rain falls very seldom. From our leaving Mazatlan, in January, to our sailing from the coast of Oajaca, on the 1st of April, we had not even a sign of a shower.

A heavy fall of dew is almost a sure indication of a breeze from the northward. A few hours previous to its springing up, the air becomes sultry and parching, and continues so during the time the "norther" is blowing. In the gulf of Tehuantepec, particularly, the "norther" is very uncomfortable. A dismal haze hangs over the land, and the wind comes off in gusts as if it had passed over a furnace, veering from N.N.W. to N.N.E. On the western coast it is generally to the westward of North.

In the dry or summer season, a vessel bound to the northward of cape Corrientes from Chili, or round cape Horn, should cross the Equator in long. 105° or between it and 110° , and proceed due North if possible. The wind in her progress to the northward will haul round from S.E. to E. and N.E., with a current setting in the same direction as the wind is blowing, or nearly so, and at times at the rate of 1 mile per hour. It is very probable that in standing with the starboard tack on board, that westing will also be made. If a ship be on the port tack, and the wind supposed to be N.N.E., she would make a very bad landfall, taking the current into consideration, even allowing her to be as far north as 15° , but by standing on as far as the latitude of cape San Lucas, there is every chance, indeed almost a certainty, of having the wind from the north-west, and at the same time the whole range of coast under the lee. I stated this opinion to the captain of an American whaler who had been on the coast several times; he fully agreed with my observations, and said that the prevailing wind on the coast of California is north-west, and that the best way to make a short passage to the Gulf of California or Mazatlan would be to keep clear of the coast of Mexico, and stand well to the northward. In the winter, or rainy season, as the wind is often from the south and east, a direct course would be most advisable.

In my passage to Mazatlan we did not stand to the northward, as I afterwards found, far enough, although we did not tack to the eastward until we were in latitude $18\frac{1}{2}^{\circ}$, the wind in general being N.E. As we got to the eastward the wind gradually hauled to the northward, when we made the coast of Mexico, about 40 miles to the south-east of cape Corrientes, from which it took us three days to get to the southward of the Marias islands. When in-shore, the wind, when it blew fresh, was from the N.W.; and when moderate, from N. to N.N.E. In the morning we had an irregular land-breeze, the current setting constantly to the S.E. From the Marias islands we were two days getting to Mazatlan, with the wind as already stated.

It appears that in the Gulf of California, in the dry or summer season, the wind is mostly from the N.W., strong breezes, with a short chopping sea. The coasting vessels always keep the California shore aboard in beating up the gulf.

The port of Guaymas is said to be the best on the whole coast of Mexico. It is also more healthy than any on the southern part of the coast. Vessels in the rainy season lay up here; it is the only place, with the exception of San Blas, that can be considered safe, on this part of the coast.

Lieutenant S. Osborn says:—

"A vessel anxious to keep on the coast of Mexico or its neighbourhood, during the bad season, cannot do better than run over to the bay of La Paz, on the west shore of the Gulf of California, and but little to the north of Mazatlan. This splendid harbour is formed by the main land of South California on the starboard hand going in, and a long chain of islands with shallow passages between, on the port hand. The most eastern island is Espiritu Santo, the north end of which lies in about lat. $24^{\circ} 30' N.$, long. $110^{\circ} 22' W.$, and has a large rock due north of it, distant 5 miles.

Approaching this bay from Mazatlan, the island of Cerralbo will be first made, high and mountainous, north end lat. $24^{\circ} 28' N.$, long. of south end $109^{\circ} 45' W.$; from it Espiritu Santo will be seen, bearing about W. by N. The bay is at least 80 miles deep, and for the first 20 miles a deep bold shore on either hand, no bottom with 20 fathoms close to the islands. Large vessels anchor under the island of San Juan

Nepomezcino; but small ones anchor within half a mile of the village of La Paz. Fish, water, turtle, cheese, and fruits are to be obtained here; and cattle, also, in the wet season, when pasturage is to be found on the coast. Snakes are very numerous and venomous.

A knowledge of the tides and currents in the neighbourhood of this port would be very serviceable; it has been much frequented by the Americans during their operations against Mexico. A vessel bound to California could only have one object in making the Mexican coast, *en route*, namely, that of communicating with her owners, by overland despatch through Mexico, and as that is a possible occurrence, I will give the few following notes for general guidance.

A vessel making the passage northward from San Blas had better make an in-shore tack, until she reaches the latitude of, or sights cape San Lucas, as she will there get the true wind, which blows almost without intermission along the line of coast from the northward. A West, or may be *south* of West course will only be first made good, but as the offing is obtained, the wind will be found to veer a little to the eastward. However, it will always be the object to make headway, and get out of the tropic without any reference to the longitude, as a strong north-west wind will soon in lat. 25° or 28° run off the distance, provided you have sufficient northing.

The attempt to beat up in-shore amounts to perfect folly, if it does not deserve a worse name, a strong current accompanying the wind; and the latter must be taken into consideration, when running in for your port with westerly winds.

Should a vessel, however, be bound to California direct, I would cross the Equator in the Pacific ocean in about 100° W. long. Cross the N.E. trade with a topmast-studdingsail set, and thus pass into the limit of the westerly winds, about 800 miles to windward of the Sandwich islands, and once in them take good care to keep to the northward of my port, for as you approach the shore, the wind will draw round north, and the current to the southward increase.

San Francisco has only two drawbacks, that of a narrow entrance in an unsheltered line of coast, where fogs are both sudden and dense, and the sudden manner in which the rollers set in on the bar at the mouth. A merchantman, however, is not so likely to miss his port when its being correctly made depends principally on knowing his latitude.

The following extract from the remarks of H.M.S. *Spy*. Lieutenant-Commander S. O. Woolridge, as to Mazatlan and Muleje bays, Gulf of California, may prove interesting, though there are in it many points stated, irrelevant to the present purpose:—

“Our passage from Callao to Mazatlan, of a few hours less than 26 days, is considered exceedingly good; indeed, one of the best ever made. As we drew in-shore, I found the current affected by the wind. With northerly winds, the current set to southward, and *vice versa*. We remained at Mazatlan 10 days, during which time the weather was, upon the whole, fine. At night we had occasionally strong squalls, with rain.

I arrived at Guaymas on the 21st, in four days from Mazatlan. During this passage, we experienced strong currents running to the N.W., from 1 to 1½ miles an hour. They were much influenced by the wind, which, from the 19th to the 21st, was southeasterly and southerly. Current also runs with more force on the eastern shore, which side we kept.

Cape Haro can be easily distinguished by the Tetras, or Paps, which resemble the tents of a goat; they are to the northward. The island of San Pedro Nolasco is just visible from the deck, to the N.W. The land of the Yagui shore is high and peaked; keeping this broad on your starboard bow, steer to the northward of a deep bay where the land breaks off, and you will soon perceive the island of Pajaros, which is at the entrance, or facing Guaymas. The water is deep all along the island of Pajaros, that is to say 4 fathoms, so close as to throw a biscuit on shore.

A large ship will have to anchor soon after passing Pajaros; that is, abreast the Morro, in 5 fathoms. A small ship can anchor inside the isles of Ardilla and Almagre, and in 4 and 8½ fathoms, just inside them; and in 8 fathoms, as far in as the point

off the town. You may go close to either of the isles *Ardilla* or *Almagre*, in 8 and 8½ fathoms.

Fresh beef and vegetables are to be obtained here, but the price depends greatly on the season of the year. Water is very difficult to be got; it is to be obtained by sending about 4 miles for it, or it can be purchased, but owing to its having to be brought in on mules or in carts, the price is very high. I wanted 12 tons, which I found could not be obtained for less than \$90, which would be nearly ten shillings a ton: I therefore weighed, August 10th, and proceeded to Muleje bay.

Conception point is difficult to make out, when you have about a dozen of the same kind within a few miles of each other. However, the best marks I can give are some table-land which is very remarkable, and is rather to the right of Muleje village. Keep this about two points on your starboard bow, and you may stand in, until you discover some sandy islets which are off a point called *Punta San Ynes*. When you are east and west with them, you will be distant from them about 8 miles. After passing these islets, steer S. and S.S.W., until you make out the *Pyramid* rock, spoken of by Captain Hamilton. This rock is named *Sombrerito*, or *Little Hat*. I think it bad to call it *Pyramid* rock, as there is a point which, in standing in, may be easily mistaken for it, resembling also a pyramid; but the rock is a pyramid fixed on a round pedestal like a fort. Another good way of making out this place is, when the wind is fair, to keep *Tortuga* island about 20 miles (?) distant, bearing about N.W., and steer in S.E., till you make out the sandy islets, and proceed as above. There is a passage between the islets and the main land for small vessels, but, though very inviting, should not be attempted. I tried it, but getting into 2½ fathoms, I put about as quick as possible. My anchorage marks in Muleje bay were as follow, in 5 fathoms:—Point Conception, N. 84° E.; *Tortuga* isle, N. 4° W.; *Lobos* isle, N. 2° E.; *Sombrerito*, S. 67° W. (*Pyramid* rock of Captain Hamilton); *Equipalito*, S. 22° W. (Rock on south side of entrance to the river); and *Punta San Ynes*, N. 10° W.

This is very close in, but I wished to facilitate the watering; about half a mile farther to the northward, in 8 fathoms, is a very good berth. In going into the bay after making out the *Sombrerito*, if you wish to go close in, take care not to bring the *Sombrerito* at all on your starboard bow; that is, do not open the mouth of the river, as, by sounding, I discovered a rock with only one fathom on it; it is on a sand-bank with 8 fathoms all round it, about three-quarters of a mile from the shore; but the rock itself has only one fathom. It lies with the entrance of the river open, directly between the *Sombrerito* and the *Equipalito* rocks, distant from half to one mile off shore.

The report of the facility of watering is very delusive and uncertain. In the first place I cannot think it possible to water out of the river, as it is salt for at least 2 or 2½ miles, and a great portion of the time, boats could not possibly get up so far. In going up the river, in boats, keep close to the *Sombrerito*, and keep the starboard shore on board, till you are one or one and a quarter miles up the river, when you will encounter a sand-bank in the centre of the river, and must keep over on the port shore to clear it. Abreast this sand-bank is the *Rancho*. At the time I visited this place, in August, owing to the dryness of the season, and the want of fodder, there was no beef or vegetables to be procured.

The bay is open to north-east winds and there is no shelter from the sea, which rolls in heavily; but with all other winds I think any man-of-war could get out, if she did not leave it too late, till the sea was too heavy, as there is plenty of room for beating.

The passage from Guaymas to Muleje bay can be easily done in 20 hours. I left Muleje again on the 14th, and arrived at Guaymas on the 16th, being 86 hours. On the 26th of August I sailed from Guaymas for Mazatlan, where I arrived on the 8rd of September, in eight days. This, at this season of the year is considered very fair, as south-easterly winds and calms prevail. I kept over, by advice, on the western shore, and passed inside of *Catalina* island; but I think the more you can keep in mid-channel the better. We experienced little or no currents, but the wind was very light, and the weather fine all the way.

On the 80th and 81st of August we had an easterly current, about 14m. per diem. We anchored off Mazatlan, about 4 miles off Creston, on the following bearings, 23

fathoms water:—Creston island, N.N.E. $\frac{1}{2}$ E.; Rock, N.E. $\frac{1}{2}$ E.; Venado, N.N.W.; and Town, N. by E. $\frac{1}{2}$ E. This is a very good berth for a large ship like the *Constance*, but on the 8th I went about $1\frac{1}{2}$ miles farther in, with the following bearings, in 22 fathoms water:—Creston, N.N.E. $\frac{1}{2}$ E.; Town, N. by E. $\frac{1}{2}$ E.; and Rock, N.E. $\frac{1}{2}$ E. This is a very good berth for a small vessel, and quite far enough off for safety, and more convenient when you have occasionally to communicate with the shore, with only one boat fit for the purpose. Here I lay till the 23rd of September: during the whole time we experienced light winds and generally fine weather. The nights were always and invariably attended with heavy thunder, and very vivid lightning, and generally heavy rain with an occasional squall.

On the morning of the 19th we experienced a very heavy squall, which lasted for about two or three hours, and the water regularly boiling, which, for the time, made me imagine that it was the commencement of a very heavy *cordonazo*: but in four hours, it had passed off, and was quite fine. As far as I could judge, the weather was not worse than you would meet with anywhere at certain seasons, but the rolling your boats into the water every now and then is the natural consequence of being anchored 3 or 4 miles off the land, in the open sea where the current at times keeps the ship swung across the wind.

On the 23rd, the barometer being very low all day, the moon being near the full, and the sun near the Equinox, it was deemed advisable to weigh, but we experienced nothing more than very terrific lightning and thunder, with heavy rain.

On the 26th, I weighed for Guaymas again. During this passage, of seven days, we had very light winds, and chiefly from the north-west.

On the 2nd October, we experienced a very heavy long rolling swell, from the south-east, which lasted two days. It was subsequently accounted for by being informed that on that day, at Mazatlan and San Blas, it blew a very heavy gale of wind: but in the gulf we had no wind but only the swell.

We arrived on the 4th of October, and sailed on the 6th for Mazatlan, where we arrived on the 18th, in seven days. During most of this passage, the winds were very light and variable, and I kept about the mid-channel. The last three days though the wind was from south-east and south-west, the current ran to the southward, from half a mile an hour. I anchored outside Creston, about 2 miles at first, but requiring about 28 tons of water, and seeing two merchant-ships inside, I weighed on the 16th, and ran in also.

Anchorage marks:—Town, N. by W. $\frac{1}{2}$ W.; Creston, N.W. by W. $\frac{1}{2}$ W.; Outer rock, S. $\frac{1}{2}$ E. At this season it is better not to anchor nearer Creston, as in case of blowing you have room to drag."

PASSAGES TO AND FROM VARIOUS PORTS IN THE PACIFIC.

The following remarks on passages to and from various ports on the coast of western America, and in the Pacific, are by Captain Beechey, R.N. :—

"**KOTZEBUE SOUND TO CALIFORNIA.**—These passages were made from October 14th to 7th November, 1826, and October 6th to 29th 1827, when north-westerly winds prevail, and consequently at a favourable time for getting to the southward. In both years they occupied exactly 23 days; and it is further remarkable, that in each, the Aleutian islands were passed on the ninth day after our departure. The route pursued by the *Blossom* was to the westward of King island, and between St. Lawrence island and the mainland of America, and thence, within sight of St. Paul and St. George islands, to the strait of Unimak.

To the eastward of King island the soundings are very irregular, varying from 9 to 6 fathoms; and as at the season above mentioned the weather appears to be generally bad, it is advisable to go to the westward of the island, where the water is deep. Between St. Lawrence island and the continent of America there is a bank with 11 fathoms water upon it. If, on approaching it in foggy weather, it be doubtful, from the shoaling of the water, whether it be not the island that is the occasion of the decrease of soundings, haul over to the American shore, and the water will deepen.

To the southward of St. Lawrence it is necessary only to mention the islands of St. Paul and St. George, which apparently may be safely approached within 4 or 5 miles; but I could not get near them in either year to ascertain what dangers lie close off the shore.

I should recommend the passage being always made to the eastward of these islands, as between them and Unimak there is a strong current from Bristol bay, which in 1827 drifted the *Blossom* 85 miles to the S.W. in the course of the day. The strait of Unimak, lying between the islands of Unimak and Ougamok, appears at present to be the safest opening to the Pacific from Kamtschatka sea. The Aleutian islands in the autumn appear to be enveloped in fog about half-way down, and to have a region of mist lying to windward of the archipelago, which makes it necessary for a ship to be certain of her position, before she attempts any of the channels as she might be led down so close upon the land in the fog, that she would not have room to rectify a mistake, should she unhappily incur any, which is very likely to happen, from the irregularity and velocity of the currents about the islands. Under these circumstances I should recommend making the north-west end of Unimak, and afterwards keeping along the coast of that island to the southward. As this island lies 40 miles to the northward of the other islands of the chain, Oumnak excepted, which is three degrees to the westward, it cannot be mistaken, unless the reckoning of the ship is very incorrect indeed. And by so doing, in the event of not liking to attempt the passage, a vessel will still be far enough to windward, supposing the breeze to be from the northward, to weather the other islands of the chain; and if from the westward, she may reach into Bristol bay.

We had no opportunity of seeing the summits of either Unimak or Unalashka, which, when clear, are good guides for the strait; but when the low land of the former can be seen, the south-west point of Unimak may be known by a pointed rock situated near the base of a remarkable wedge-shaped cliff, conspicuous from the northward and north-westward. The narrowest part of the strait is between this rock and Ougamok island, and the distance exactly $9\frac{1}{4}$ miles, in a S. $1^{\circ} 80' E.$ (true) direction. In a line between these, at the distance of 4 miles from the rock, there are soundings in 80 fathoms, and I understand that if necessary there is anchorage close under Unimak.

Ougamok island is about 4 miles in length, and may be known by a remarkable peak near its N.E. extremity, in lat. $54^{\circ} 16' 52'' N.$, long. $164^{\circ} 47' 6'' W.$

From the Aleutian islands to San Francisco we steered nearly a direct course, with winds generally from N.W. and W., and made point Reyes on the 8rd November. In this passage the currents were variable. From Behring strait to the Aleutian islands they prevailed to the westward, and near the islands ran strong, but afterwards they continued between S.E. and S.W. On our arrival off California, the whole amount, in 1826, was S. $89^{\circ} W.$, 64 miles; and in 1827, S. $26^{\circ} W.$, 40 miles.

MONTEREY to OAHU, SANDWICH ISLANDS.—This passage (January 5th to 25th, 1827,) was begun at a period when the north-west and westerly winds are proverbially prevalent upon the coast of Oregon, and extend a considerable distance to the westward.

We sailed from the bay of Monterey on the 5th of January, and immediately took a northerly wind, which carried us into the trades; and we arrived off Maui on the twentieth day. Our passage might have been considerably shorter, had we not taken a circuitous route in search of some islands reported to lie to the southward, and had sail been carried throughout the 24 hours, instead of hauling to the wind as soon as it was dusk, to maintain our position during the night, that nothing might be passed unseen within the limit of our horizon.

As we left the extra-tropical latitudes, the atmosphere gradually became more hazy and humid, the clouds increased, and in $18^{\circ} N.$ we had some showers of rain. On the 18th, in lat. $16^{\circ} 18' N.$, long. $186^{\circ} W.$, we had a very strong trade at N.E., with squally weather, and a long cross sea from the westward, which was afterwards found to be the effect of a gale of wind in the parallel of $21^{\circ} N.$; but which did not reach us.

There was very little current in this passage; this little generally ran to the southward and westward, and averaged 3.6 miles a day. The barometer, though so far entered in the tropical latitudes, was perceptibly affected by the changes of weather, but maintained its horary oscillations.

On my arrival I found that from the 15th to the 21st there had been very strong gales from the westward at Oahu, and from S.W. at Hawaii. This was, no doubt, the cause of the high cross sea we experienced from the 18th to the 23rd. I found also that the *Harbinger*, an American brig which quitted Monterey nine days after the *Blossom*, was obliged to lie-to for three days, from the 20th to 23rd January, in a strong gale from the S.W. She had steered a direct course from the Sandwich islands, in which she experienced very variable winds, and, on the whole, had bad weather, and was only one day less performing the passage than ourselves; whence I think it fair to conclude that nothing is lost by running well into the trade. During the winter season, I should recommend ships gaining the 17th parallel before they shaped a direct course for the islands. This seems to me to be the best mode to ensure a good passage and fine weather.

SAN FRANCISCO to SAN BLAS (MEXICO).—We found no difficulty (December 6th to 21st) in getting to the southward, the prevailing wind at this season being from the N.W. It is advisable, however, to stand about 40 or 50 leagues off the coast, to avoid interruptions from variable winds, which occur near the land. These winds are in general taken advantage of by vessels bound in the opposite direction to that of our present course.

The weather throughout this passage was remarkably fine. The wind was from W.N.W. to N.N.E., until we made cape San Lucas, when it veered to E.N.E., and obliged us to pass between the Marias islands. This route occasioned the loss of a day, and I should advise any vessel making the passage to close the land to the northward of cape San Lucas, provided the wind is in the north-east quarter; as in addition to the inconvenience which a shift of wind to the E. would occasion, there is another arising from a strong current, which generally sets out of the Gulf of California. From the cape steer for Isabel island, and thence for Piedra del Mar.

Between 88° N. and cape San Lucas we found a current to the westward, and from the cape to the Marias islands to the southward. The whole effect of current from San Francisco to these islands was S. 58° W., 80 miles.

SAN BLAS to ACAPULCO and VALPARAISO.—At this season (March 8th to May 1st, 1828) north-westerly winds prevail upon the coast between San Blas and Acapulco, inclining towards the land in the day, and to the sea at night. We passed 4 miles to westward of Corventena (a small rock situated N.W. by N., 19 miles, from cape Corrientes,) without having soundings in 80 fathoms. On the 10th we were within sight of the volcano of Colima, 12,008 feet above the sea, and on the 18th anchored at Acapulco.

At San Blas we heard various opinions upon the best route from Acapulco to Valparaiso, some being in favour of a passage to the eastward of the Galapagos, by keeping along the land, and carrying the N.W. wind, and others to the westward, by steering at once out to sea. We adopted the latter mode of proceeding; and after light and variable winds, principally from the eastward, crossed the Equator in 99° 40' W. on the eleventh day of our passage, about two degrees more to the westward than was intended.

After two days' unsettled weather and hard showers of rain we got the S.E. trade in 3° S. latitude. It was at first held to the southward, but, as we proceeded, veered gradually to the eastward, and obliged us to make a long sweep, in which we went as far to the westward as 108°, and having brought us into 23° S. and 106° W. it left us. We had afterwards variable winds and squally weather, and found some difficulty in approaching our destination. At this season very unsettled weather prevails on the coast of Chili, and storms and heavy rains from the northward are by no means unfrequent. It appears to me to be advisable at this period to steer direct for the port, if possible, and to disregard the chances of winds and of currents near the land. The currents in the first part of this passage ran about 7 miles a day to the eastward, but from 8° N. and 98° W. to 19° S. and 108° W. they flowed in a S. 88° W. direction, at the average rate of about 28 miles per day, and on our arrival at Valparaiso they had drifted the ship S. 81° W., 401 miles, or at the average rate of 11½ miles a day.

On account of these strong currents it is desirable to cross the Equator well to the eastward, in about longitude 96° or 97° W., and to pass the latitudes in which they prevail as quickly as possible, by keeping clean full."

SAN FRANCISCO TO PERU.—The following remarks are by Maury and are extracted from an article on the subject in the *Mercantile Marine Magazine*, 1854:—

"The best route from California to the guano islands of Peru, is the track from California to the United States, until the belt of the S.E. trade winds be crossed; or until they will allow the guano bound vessel to lay up for her port. Though the guano islands are in 12° S., vessels bound to them from California will frequently have to go as far south as 35° to 40° , or even farther, before they can lay up for them.

When a vessel, therefore, bound for Peru, comes out of San Francisco, her best course is to run down for the Equator, about its intersection with the meridian of 115° to 120° (125° is not too far) and with topmast studding-sail set, to stand on to the southward until the wind hauls so as to allow her to lay up for her port; or, when the wind fails so to haul, she should keep on south across the calm-belt of Capricorn, and with the west wind on the polar side of these calms, run down easting enough, so that when she returns to the S.E. trades, they will lead her into port.

The usual passage from California to these islands now occupies from 65 to 70 days; by the route here recommended, it should not be so long. The way is plain; dash down from California, not caring to make easting until the winds are fair for Callao. Every homeward bound vessel from California crosses the track of the guano traders from Australia.

The *Comet*, to where she crossed it (lat. 49° S., long. 107° W.), had 28 days; and from this crossing (which is out of the route from San Francisco to Callao) the guano traders from Australia have usually from 20 to 25 days to Callao.

The passage from San Francisco to the guano islands of Peru ought not, on the average, to occupy more than 55 days."

ENGLAND to VANCOUVER ISLAND.—The following remarks are by Captain J. F. Trivett, late of the Hudson Bay Company's service, and for some time Examiner in Navigation to the Local Marine Board at the port of London:—

"The colonies of British Columbia and Vancouver island, although so little known or appreciated at present, are destined at no distant period to become very important possessions of Great Britain; the former containing all the elements necessary for the formation of a Western Canada, with considerable mineral wealth—as gold, silver, &c.; and the latter, in addition to its inexhaustible mines of fine coal, not only possesses valuable fisheries, but its fine harbours are available at all times for ships of the largest size, and in the interior, hemp is found growing wild, which having been tested in England has been pronounced equal to that of Russia.

One great drawback in connection with these colonies has been the length of a voyage from England. May not this be amended—I shall endeavour to shew that it can.

The passages from England to Vancouver island have hitherto been very long, I admit; but yet, if we take the average of those passages it will be found not to exceed that of the passages from England to Calcutta and to Australia, when the navigation to those places was as little known as the proper route to Vancouver island appears to be at present. I am convinced that a stout ship, of good sailing qualities, could, on the average, make her passage from England to Vancouver island under 120 days.

Having made many voyages to that part of the world, my present object is to give my experience as to the best route to be adopted in making a passage from England to Vancouver island.

Of that part from the Channel to the Equator—the old beaten track—nothing need be told; however for the information of those who may not have seen Commander Maury's valuable "Sailing directions," I would say—do not bother yourself about where you are to cross the Equator providing you do not go to the westward of 81° ; but, of course, no man would choose such a leewardly position if he could avoid it. I have twice crossed in 81° , and found no difficulty in weathering cape San Roque; and I have frequently passed to leeward of Fernando Noronha.—Should you be driven to the westward after crossing the line, take every advantage of the shifts of wind, and stand to the eastward occasionally, so as to keep cape San Roque on a certain bearing, and do not fall to leeward of it. Maury cites instances of American ships crossing the

line in 35° west, and even then weathering cape San Roque without much difficulty. I consider ships from England should cross the line between 27° and 31° W. I have not crossed east of 27° W. for some years.

After passing cape San Agostinho, I would keep about 150 to 180 miles from the outline of the Brazil coast, endeavouring to cross the southern tropic in about 39° W.; then steer in a direct course to pass 40° S., in about 56° W. If, in the neighbourhood of the river Plate, about the full or change of the moon, strong S.E. breezes may be expected: I have generally carried double reefs, and made good runs with them; off the river Plate the water is generally discoloured a considerable distance seaward; I have obtained soundings in 40° 24' S., 56° 31' W.—70 fathoms fine sand; from the above position I would endeavour to make the land about Valdes peninsula, or cape Dos Bahias,—if I could do so without loss of time; I consider those places better than cape Tres Puntas or cape Blanco, as dangers exist in the vicinity of the last named position and extend some distance from the land. After passing cape Blanco, I steer a true South course for cape San Diego or to windward of it.

I consider this to be an important part of the passage; and a great improvement on the old route—outside or east of the Falklands; along the inner route you frequently meet with heavy breezes from off the land, which of course, will induce you to keep in with the land to obtain the benefit of the smooth water, and at such times (under close reefs and reefed courses), I have made good days to the southward; when by the old route, outside the Falklands, I should have been laying-to, drifting to the N.E.

No danger exists between the Falklands and the main, but a bank of soundings is laid down on the charts, by which, in thick weather, it is useful to test your reckoning. American ships frequently make cape Penas, Tierra del Fuego, which I think not unadvisable, although I have never done so myself.

If the wind, weather, and daylight serve, always go through the strait of Le Maire. In October 1856, I entered the strait about noon, with a fresh N.W. breeze, kept about 5 miles distant from the Fuegian shore, and at 2:30 p.m. was clear of the strait. With a N.W. wind keep well out from the high land of cape Good Success, as you are likely to get becalmed under its lee,—at least, such was my case, as also that of a ship in company—both had to run out S.E. to get the true breeze. I have twice attempted the strait since that voyage, but on each occasion was driven back by strong southerly winds. During my last voyage I lay-to very comfortably under the lee of Staten island during a heavy gale from S.W. which lasted 30 hours, Bar. 28.77.

There is no danger to apprehend in approaching the east coast of Patagonia, from strong easterly winds, as Captain Symley and American Captains engaged in the sealing trade can testify. Captain Symley has passed 22 years of his life between south Shetland and the river Plate, and for 6 years was never to the northward of 40° S.; during all that time he never knew the wind to blow heavy, directly on the shore, for 12 hours continuously.

The prevailing winds on the east coast of Patagonia are West and N.W. In steering from the east end of Staten island towards cape Horn, a strong indraught from the southward towards the strait of Le Maire (to N.N.E.) should be guarded against.

When up with cape Horn, little is required to be said, beyond what is evident to the sense of every navigator—make westing—whatever you do—make westing—but to make it, there lies the rub; to do so, or to endeavour to do so, very often tries both ship and crew severely, yet sometimes I have been lucky enough to get round this abominable cape with little or no trouble. I see no necessity to go so far south as some recommend; I would at all times lay my ship upon that tack which makes the most westing—endeavouring at the same time to maintain a sufficient offing to make good use of a S.W. wind.

Much difference of opinion exists as to the utility of the barometer in this part of the world, some Captains go so far as to say a ship is better without one; for my own part I have never seen the mercury fall greatly without a change following it—with wind, rain, or snow; yet after the change I have known the mercury to remain low, ranging about 28.50 for several days with very fine weather, and at such times have generally had more wind after the mercury had commenced rising.

In no part of the world that I am acquainted with (and I have been pretty well all over it) is such constant attention to the appearance or signs of the weather requisite as in the neighbourhood of cape Horn. I have frequently been compelled to take in sail as quick as possible—from all sail to a close reefed main topsail—and glad to get that in also.

After having rounded the Horn, and attained the longitude of 80° W., it is advisable to steer about W.N.W., if the wind will allow you, for the purpose of making your westing where the degrees are short; you can afterwards steer more northerly in the S.E. trades, and bring those winds more on the beam; but it is seldom that such a westerly course can be steered in this locality, for the prevalent winds are from the N.W. quarter, and you are frequently compelled to make easting with your northing. It is no uncommon occurrence to make the island of Juan Fernandez,—indeed, ships may be driven to the eastward of it by the continuance of westerly winds. I once carried the westerly winds as far north as San Felix island.

Having obtained the S. E. trades, which you will usually do about the southern tropic, steer to cross the Equator in longitude 118° W.

Here again, the *New Route*, if I may be allowed the term, differs from what I shall call the *Old Route*. Ships formerly used to cross the equator in about 104° W., and frequently used to make the Clipperton rock. By thus crossing the Equator too far to the eastward, you are more likely to meet with calms, rains, squalls, and the usual equinoctial doldrums; and are less likely to meet the N.E. trades until well north—in the summer time, probably not have them at all, and a very long passage may be the result. From the researches of Commander Maury we have the passages of 445 vessels from cape Horn to California, with the longitude of their crossing the Equator, and the result is that the best passages are made by those ships which cross the Equator in longitude 115° to 120° W.; the principal cause of this being that they meet with less calms, and get the N.E. trades sooner than those ships do which cross further to the east.

Having got the N.E. trades, which you do generally in about the parallel of 7° N., it will be better to make a fair wind of them; at least, endeavour to cross the northern tropic in longitude 134° W.—not to the eastward of that; as a general rule, the farther you are from the coast of North America, the more likely you are to have a fresh N.E. trade.

In January 1859, I crossed the northern tropic in the Hudson Bay Company's steam vessel (under sail alone) in long. 127° W., the winds gradually failing, until at length it fell quite calm, when we got up steam: about the same time the Honourable Company's ship *Princess Royal*, 7° further to the westward, had a fresh N.E. wind, which she carried as far as 40° N., shewing the advantage to be gained by keeping well to the westward.

After losing the N.E. trades, and having got through the belt of calms which sometimes exists outside their northern border, N.W. winds are generally met with; my plan is to get cape Classet on a N.E. bearing as soon as possible, and then steer for it, because N.W. and S.E. winds being very common about the entrance of the strait of Juan de Fuca, both those winds will be fair.

Approaching the entrance of the strait in the night, or in thick weather, a ship should be certain of her latitude; and it is safer to be in error to the northward than to the southward. The coast of America south of cape Classet is dangerous to approach, in thick weather, as rocks lie some distance off the shore. I have remarked, by the colour of the water, that a bank of soundings appears to exist off the entrance to Barclay sound, Vancouver island; but the water darkens again in colour as you proceed eastward; the south coast of Vancouver island should be avoided when there are light winds: as, should it fall calm, you will be at the mercy of the heavy swell almost always setting on the shore; and rendering it at times difficult to get off the coast. I once narrowly escaped destruction about Bonilla point by drifting close to the shore during light baffling winds from the southward. I will add, you soon lose sight of the light on Tatoosh island (as you proceed up the strait) by the projecting land about Nee-ah bay. The prominent and projecting land about Callam bay and point Pillar is in each case a very good mark to distinguish your whereabouts during almost any night if you keep your course along the southern shore, which is generally thought to be the

safest. The light on the Race rocks is an excellent one, and renders the navigation of that part comparatively easy. A navigator visiting these regions should provide himself with the small charts of the several anchorages about the strait, such as Néé-ah bay, port San Juan, Sooke inlet, Becher and Pedder bays, &c., as well as the charts of the various anchorages in the neighbourhood of cape Horn.

Ships from sea bound up the strait of San Juan de Fuca should steer for the light on Tatoosh island at the entrance of the strait, and in doing so the latitude at least should be correctly known; but as in the winter time, in this climate, the sun may be clouded for many days consecutively, it will be necessary to embrace every opportunity of ascertaining the latitude by sidereal observations, and by double altitudes of the sun when visible; it is safer to be in error to the northward, than to the southward—the coast of Vancouver island being comparatively bold to approach, and the high land in the neighbourhood of Barclay sound, a little westward of the entrance of the strait, is visible at a great distance, even in the night, if it be clear.

When the wind from the southward or S.W., you may expect to feel the influence of a set to the northward, as you approach the coast.

With light S.E. or easterly winds, do not approach the Vancouver island shore, when outside the strait: those winds are very likely to leave you becalmed near the land, and at the mercy of the heavy swell which is almost always found setting on to the shore—which I once painfully experienced.

Having made out the entrance, pass the lighthouse on Tatoosh island at a safe distance, say 8 miles, and proceed up the strait, keeping the southern shore on board, and in doing so, the light will soon be lost sight of, by the projecting land about Néé-ah bay. The bay is easily distinguished, and although it will afford good anchorage in case of necessity, it had better be avoided by sailing ships of large size, as vessels have been driven on the surrounding reefs by the tide, when getting under way, and before any command of them could be obtained. The Americans generally avoid it.

When abreast of Néé-ah bay, the deep indentation on the coast of Vancouver island which forms port San Juan will be plainly visible, even in a dark night.

As you proceed up the strait, keeping about 8 miles distant from the line of the southern shore, the projecting land forming the east point of Callam bay is a good landmark in the night. Callam bay is said to afford shelter during strong easterly winds.

From above Slip point, the point alluded to in the preceding paragraph, the coast is bold and may be approached with safety as far as point Pillar, which is another remarkable landmark, and serves the mariner to distinguish his position even in a dark night; when seen from the eastward during the night, it appears like a little round island, or headland, jutting out into the strait.

When abreast of point Pillar, from a ship's topsail-yard, or from the height of 60 feet, in a clear night, the light on the Race rocks will be visible distant about 23 miles; and from an ordinary ship's deck, or 16 feet, it will be visible at about 18 miles, a brilliant *flashing* light.

Having once sighted the Race rock light, do not lose it by standing over to the north shore, and shutting it in by Beechey head.

When abreast of Sooke inlet the tide rips and eddies will begin to be felt. These eddies sometimes take charge of a ship in light winds and turn her round against helm and sails, for which reason ships should be careful to keep out of the stream of tide of the Race rocks. With light winds, vessels have been carried through the Race channel by the force of the tidal current, and others, not so fortunate—the *Nannette*, a recent case for example—was driven on the rocks and sunk in about 4 fathoms. Ships, therefore, unless with a commanding breeze, should keep well out from the Race rocks.

With a commanding breeze from the westward, round the lighthouse at the distance of about $1\frac{1}{2}$ or 2 miles, and if bound to Victoria or Esquimalt, in the day time steer direct for your port, or to windward of it according to wind and tide. Pilots will come out from Victoria upon your making the requisite signal. For Esquimalt or Royal bay, the chart and Captain Richards' directions will be quite sufficient.

In the night time, with a commanding westerly breeze round the Race rocks, as above, and gradually haul up to the N.W. or as far as the wind will allow you, for Parry bay,

or until you bring the Race light to bear S. by E. ; you will then be pretty well under shelter of the land, and may get your heavy sails furled if it be blowing hard, or otherwise considered necessary.

Shortly after rounding the Race rocks, you will see the light on Fisgard island at the west side of the entrance to Esquimalt harbour. In hauling up for Parry bay, do not shut in this light with Albert head. You may pass Albert head at the distance of half a mile or less, then bring Fisgard light to bear N. by W., steer for it, and anchor in 12 fathoms, an excellent berth and good holding ground.

When passing Albert head, you will have no bottom with the hand lead, but stand boldly on under easy sail, and you will soon find 17, 15, 18, and 12 fathoms. Anchor as above directed.

If bound to Victoria with an easterly wind, and should you be up with the Race rocks during the night, it will be prudent for a stranger to continue working to the eastward, giving the Race rocks a good berth, (and also guarding against Ediz hook, on the American shore, which is low and very dangerous in a dark night) until the light on New Dungeness is visible from the deck ; then from the bearings of the two lights there can be no difficulty in maintaining a safe and weatherly position until daylight, when a course can be shaped according to circumstances.

Pilots are always in attendance for Victoria harbour ; they are attentive and skilful ; vessels drawing 17 feet can enter at the proper time of tide with safety. The harbour accommodation is very limited, and ships discharge their cargoes generally by laying alongside the wharves, where they ground at low water ; the best and safest wharves are well up the harbour, towards the bridge.

Vessels from Victoria, bound down the strait, meeting with a fresh westerly wind, had better remain at anchor in Royal bay, until there is a prospect of a fair wind—for little good can be done in the narrow part of the strait with a foul wind.

Port Angelos, on the southern shore, is a good and safe anchorage ; New Dungeness should be avoided. But should vessels be well to leeward and caught by a westerly gale, port Townshend will be found an excellent harbour. For these last named anchorages, the chart with Captain Richards' directions will be found amply sufficient to enable any stranger to take his ship to a place of safety.

A fixed white light is now placed on Admiralty head, which must be of great service to vessels running for port Townshend in the night.

Vessels sometimes anchor on what is called "The Bank," between point Wilson and point Hudson when shelter only is required ; a good berth must be given to point Wilson to avoid the reef which lies off it—also to point Hudson for a similar reason."

SAN FRANCISCO HARBOUR REGULATIONS, &c.*

Extracts of Pilot Regulations—approved March 29th, 1878.

All vessels, their tackle, apparel, and the furniture, and the master and owners thereof, are jointly and severally liable for pilotage fees, to be recovered in any Court of competent jurisdiction.—*Political Code*, page 443, Section 2482.

Every pilot, on boarding a vessel, when required by the master thereof, must exhibit his commission as pilot. A refusal so to do subjects him to a forfeiture of his commission or license, and a recovery of fifty dollars on his bond, in a suit instituted for that purpose by the authority appointing him.—*Political Code*, page 444, Section 2484.

Every pilot carried to sea against his will, or unnecessarily detained on board of a vessel, when a pilot boat is in attendance to receive him, is entitled to receive the sum

* These harbour regulations, &c., &c., are extracted from *Tennent's Nautical Almanac*, for 1880, published at San Francisco.

of eight dollars per day while necessarily absent or detained, not to exceed in the aggregate the sum of one thousand dollars in any one case, which sum may be recovered by an action against the master or owner of the vessel so taking him away.—*Political Code*, page 444, Section 2485.

Every pilot in charge of a vessel arriving in the port of San Francisco, must safely moor the vessel in such position as the master of the vessel or Harbour Master may direct. He must prevent all persons, (except officers of the State or Federal Governments, owners or consignees of the vessel or cargo, and persons admitted on the express orders of the master) from boarding such vessel until she has been safely moored. To enforce the provisions of this section and other police regulations for the harbour of San Francisco, every pilot in charge of a vessel entering the harbour of San Francisco is authorized and empowered to arrest every one who, in opposition to the master's orders persists in boarding such vessel, or who, having boarded her, refuses to leave on the command of such master or pilot; when so arrested, he must be immediately brought before the Police Judge's Court, or admitted to bail, as provided in the Penal Code.—*Political Code*, Vol. 1, page 449, Section 2459.

The pilotage inside the Heads to the anchorage opposite San Francisco, and about the harbour, or between the harbour of San Francisco and the ports of Mare island, Vallejo, or Benicia, must be at such rates as agreed on between the parties, not to exceed five dollars per foot draught.—*Political Code*, page 452, Section 2465.

The following are the rates of pilotage into or out of the harbour of San Francisco: Vessels under five hundred tons, five dollars per foot draught; vessels over five hundred tons, five dollars per foot draught, and four cents per ton for each and every ton of registered measurement. Vessels engaged in the whaling or fishing trade shall be exempt from all pilotage except where a pilot is actually employed. When a vessel is spoken, inward or outward bound, and the services of a pilot are declined, one-half of the rates must be paid. In all cases where inward bound vessels are not spoken until inside of the bar, the rates of pilotage and one-half pilotage must be reduced fifty per cent.—*Political Code*, Vol. 1, 452, Section 2466.

Any vessel in tow of a steam-tug between the harbour of San Francisco and the ports of Mare island, Vallejo, or Benicia, is not liable for pilotage unless a pilot is actually employed.—*Political Code*, pp. 452, 458, Section 2467.

All vessels coasting between San Francisco and any port in Oregon, or in Washington or Alaska territories, and all vessels coasting between ports of this State, are exempt from all charges of pilotage unless a pilot is actually employed.—*Political Code*, page 452, Section 2468.

If any pilot, in endeavouring to assist or relieve any vessel in distress, suffers loss or damage in his boats, sails, tackle, rigging, or appurtenances, the master, owner, or consignee of such vessel must pay the value of such loss or damage, to be ascertained by the Commissioners. (Section 2488.)

When cruising off or standing out to sea, pilots must go to a vessel nearest to shore, or in the most distress, under a penalty of one hundred dollars. For refusing to go on board a vessel when required, a like penalty may be imposed. (Section 2487.)

When two or more pilots shall offer their services to any vessel inward bound, the pilot first offering, or one connected with the same boat, shall have preference; and if the services of another be accepted, the vessel, her appurtenances, and the master and owner thereof shall be jointly and severally liable to the pilot entitled to such preference for one-half the amount of pilotage he would have been entitled to had his services been accepted. (Section 2469.)

Any pilot bringing a vessel into the harbour (or one connected with his boat) shall be entitled to take such vessel to sea again when she departs; provided, such pilot and those connected with his boat have not in the meantime become in any manner disqualified or incapacitated; and if such preference be disregarded by the master of such vessel, the vessel, master, and owner shall be liable to the pilot entitled to such preference for one-half the amount to which he would be entitled if his services had been accepted. (Section 2470.)

Extracts from the Health and Quarantine Laws for the Harbour of San Francisco.—January 1st, A. D. 1878.

The quarantine grounds of the bay and harbour of San Francisco, are at the anchorage of Saucelito.—*Political Code*, vol. 1, page 562, Section 8004.

Shipmasters bringing vessels into the harbour of San Francisco, and masters, owners, or consignees having vessels in the harbour, which have on board any cases of Asiatic cholera, small-pox, yellow fever, typhus, or ship fever, must report the same in writing to the Health Officer before landing any passengers, casting anchor, or coming to any wharf, or as soon thereafter as they, or either of them, become aware of the existence of either of these diseases on board of their vessels.—*Political Code*, vol. 1, page 564, Section 8018.

No captain or other officer in command of any vessel sailing under a register, arriving at the port of San Francisco, nor any owner, consignee, agent or other person having charge of such vessel, must, under a penalty of not less than one hundred dollars, land, or permit to be landed, any freight, passengers or other persons from such vessel, until he has reported to the Health Officer, presented his bill of health, and received a permit from that officer to land freight, passengers, or other persons.—*Political Code*, vol. 1, page 565, Section 8014.

Every pilot who conducts into the port of San Francisco any vessel subject to quarantine or examination by the Health Officer must :

First—Bring the vessel no nearer the city than is allowed by law.

Second—Prevent any person from leaving, and any communication being made with the vessel under his charge, until the Health Officer has boarded her and given the necessary orders and directions.

Third—Be vigilant in preventing any violation of the quarantine laws, and report without delay all such violations that come to his knowledge to the Health Officer.

Fourth—Present the master of a vessel with a printed copy of the quarantine laws, unless he has one.

Fifth—If the vessel is subject to quarantine, by reason of infection, place at the masthead a small yellow flag.—*Political Code*, vol. 1, page 565, Section 8015.

Every master of a vessel subject to quarantine, or visitation by the Health Officer, arriving in the port of San Francisco, who refuses or neglects either :

First—To proceed with and anchor his vessel at the place assigned for quarantine, when legally directed so to do ; or,

Second—To submit his vessel, cargo, and passengers, to the Health Officer, or furnish all necessary information to enable that officer to determine what quarantine or other regulations they ought respectively to be subject to ; or

Third—To report all cases of diseases and deaths occurring on his vessel, and comply with all the sanitary regulations of the bay and harbour : is liable in the sum of five hundred dollars for every such neglect or refusal.—*Political Code*, page 566, Section 8016.

All vessels arriving off the port of San Francisco from ports which have been legally declared infected ports, or all vessels arriving from ports where there is prevailing at the time of their departure any contagious, infectious, or pestilential disease, or vessels with decaying cargoes, or which have unusually foul or offensive holds, are subject to quarantine, and must be by the master, owner, pilot, or consignee, reported to the Health Officer without delay. No such vessel must cross a right line drawn from Meigs' Wharf to Alcatraz Island, until the Health Officer has boarded her and given the order required by law.—*Political Code*, page 566, Section 8017.

The Health Officer must board every vessel subject to quarantine or visitation by him, immediately on her arrival ; make such examination and inspection of vessel, books, papers, or cargo, or of persons on board, under oath, as he may judge expedient, and determine whether the vessel should be ordered to quarantine, and if so, the period of quarantine.—*Political Code*, Section 8018.

No captain or other officer in command of any passenger-carrying vessel of more than one hundred and fifty tons burden, nor of any vessel of more than one hundred

and fifty tons burden having passengers on board, nor any owner, consignee, agent, or other person having charge of such vessel or vessels, must, under penalty of not less than one hundred dollars, nor more than one thousand dollars, land, or permit to be landed, any passenger from the vessel, until he has presented his bill of health to the Health Officer, and received a permit from that officer to land such passenger; except in such cases as the Health Officer deems it safe to give the permit before seeing the bill of Health.—*Political Code*, Section 8019.

The following fees may be collected by the Health Officer: For giving a permit to land freight or passengers, or both, from vessels of less than one thousand tons burden, from any port out of this State, two and a half dollars; from any port in this State, one dollar and a quarter; from any passenger-carrying vessel of more than one thousand tons burden, three dollars and seventy-five cents; for vessels of more than one thousand tons burden, carrying no passengers, two dollars and fifty cents; for vaccination of each person, one dollar.—*Political Code*, Section 8020.

The Board of Health may enforce compulsory vaccination on passengers in infected ships, or coming from infected ports.—*Political Code*, Vol. 1. Section 8021.

Whenever any cause of action arises under any one of the provisions of this chapter, suit may be maintained thereon in the name of the Health Officer, in any District Court in this State.—*Political Code*, Vol. 1, Section 8032.

Extracts from Harbour Police Laws.

No person shall board, or attempt to board, any vessel arriving in the harbour of the City and County of San Francisco, before said vessel has been made fast to the wharf, without obtaining leave from the master, or other person having charge of said vessel, or permission in writing from the owner or owners, or the agent thereof; or having boarded such vessel, shall refuse or neglect to leave the same upon request of the master, or other person in charge thereof, under the penalty prescribed in the next succeeding section of this Act.

Any person violating Section One of this Act shall be deemed guilty of a misdemeanor; and upon conviction thereof before the said Judge's Court of said city and county, shall be punished for each offence by a fine not exceeding one hundred dollars, or imprisonment in the County Jail of the City and County of San Francisco for a term not exceeding fifty days, or both, in the discretion of the Judge of the said Police Judge's Court, which Court shall have jurisdiction in such cases.

The provisions of the last two foregoing sections shall not apply to any pilot or public officer, visiting a vessel in the discharge of his duty.

The word "harbour," as used in this Act, shall be held to mean and include all the waters of the Bay of San Francisco, within the limits of the City and County of San Francisco; and the word "vessel," as used in this Act, shall be held to mean and include all vessels propelled by steam or sail, plying or bound on a voyage between the said port of San Francisco and other ports in the State, or in any other State of the United States, or in any foreign country.

HARBOUR POLICE SIGNALS.

Between sunrise and sunset, the national flag in the mizzen rigging, and between sunset and sunrise, a green or blue light, at least twelve feet above deck.

Extracts of General Laws.

Every captain, master of a vessel, or other person, who wilfully imports, brings, or sends, or causes or procures to be brought or sent, into this State, any person who is a foreign convict of any crime which, if committed within this State, would be punished

therein (treason and misprision of treason excepted), or who is delivered or sent to him from any prison or place of confinement, in any place without this State, is guilty of a misdemeanor.—*Penal Code*, Section 173.

Every person bringing or landing within this State any person born either in the Empire of China or Japan, or the islands adjacent to the Empire of China, without first presenting to the Commissioner of Immigration evidence satisfactory to such Commissioner that such person desires voluntarily to come into this State, and is a person of good character, and obtaining from such Commissioners a permit describing such person, and authorizing the landing, is punishable by a fine of not less than one or more than five thousand dollars, or by imprisonment in the County Jail not less than two nor more than twelve months.—*Penal Code*, Section 174.

Every master of a vessel subject to quarantine or visitation by the Health Officer arriving in the port of San Francisco, who refuses or omits: *First*. To proceed and anchor his vessel at a place assigned for quarantine at the time of his arrival; or, *Second*. To submit his vessel, cargo and passengers to the examination of the Health Officer, and to furnish all necessary information to enable that officer to determine to what length of quarantine and other regulations they ought respectively to be subject; or, *Third*. To remain with his vessel at quarantine during the period assigned for her quarantine, and while at quarantine, to comply with the regulations prescribed by law, and with such as any of the Officers of Health, by virtue of authority given them by law, shall prescribe in relation to his vessel, his cargo, himself, his passengers, or crew, is punishable by imprisonment in the County Jail not exceeding one year, or by fine not exceeding two thousand dollars, or both.—*Penal Code*, Section 376.

Every person who, within the anchorage of any port, harbour, or cove of this State, into which vessels may enter for the purpose of receiving or discharging cargo, throws overboard from any vessel the ballast, or any part thereof or who otherwise places or causes to be placed, in such port, harbour, or cove, any obstruction to the navigation thereof, is guilty of a misdemeanor.—*Penal Code*, Section 618.

Every person who entices seamen to desert from any vessel lying in the waters of this State, and on board of which they have shipped for a term or voyage unexpired at the time of such enticement, is guilty of a misdemeanor.—*Penal Code*, Section 644.

Every person who harbours or secretes any seaman, knowing him to be shipped, and with a view to persuade him to desert, is guilty of a misdemeanor.—*Penal Code*, Section 645.

When steamers meet, each must turn to the right, so as to pass without interference.—*Political Code*, Vol. 1, Section 2360.

When any steamer is running in the night time, her master must cause her to carry two conspicuous lights, one exposed near her bow, and the other near her stern; the latter must be at least twenty feet above her deck.—*Political Code*, Vol. 1, Section 2366.

The owners of every steamboat are responsible for the good conduct of the master or other person in charge employed by them; and they are jointly and severally liable for every penalty incurred by the master, engineer, or other person in charge, which cannot be collected from him by due course of law, as if they were his sureties.—*Political Code*, Vol. 1, Section 2878.

If any master, agent, or owner of any water craft, shall refuse or neglect to obey the lawful orders or directions of the chief wharfinger, in matters pertaining to the regulations of said harbour, or removal or stationing any water-craft therein, such master, agent, or owner, so refusing or neglecting, is guilty of a misdemeanor and upon conviction thereof before any Court of competent jurisdiction, shall be punished by a fine not to exceed three hundred dollars, or by imprisonment, but not to exceed one hundred days in the jail of the City and County of San Francisco.—*Political Code*, Section 2541.

Three State Harbour Commissioners.—*Political Code*, Section 843.

They have possession of all that portion of the Bay of San Francisco along the water front of the City and County of San Francisco, and adjacent thereto, to the distance of six hundred feet into the waters of the bay from the line of the water-front, as defined by an Act of the Legislature of this State, approved March 26th, A. D., 1861, together

with all of the improvements, rights, privileges, franchises, easements and appurtenances connected therewith, or in anywise appertaining thereto, excepting such portions of the water-front as are held under valid leases; and must also take possession and have the control of any and all such portions of the water-front, with the improvements, rights, privileges, franchises, easements and appurtenances, as are held under valid leases, if any exist, as soon as the leases respectively expire or become void.—*Political Code*, Section 2522.

The harbour of San Francisco is hereby placed under the control of the Board of State Harbour Commissioners, and they are authorized to regulate the position of ships, their moorings and anchorage, and generally to make rules and regulations concerning them, with power to enforce the same as fully as that formerly used and exercised by the Harbour Master of the City and County of San Francisco.—*Approved March 30th, 1874.*

The Commissioners shall keep the routes of the ferry-boats passing in and out of said harbour free and open at all times, so that ferry boats can conveniently make their trips without impediment on the part of vessels at anchor or other obstructions. The present Harbour Master of the City and County of San Francisco * * * shall, during his term of office, perform such services in and about the management and regulation of said harbour as the Commissioners may require of him.—*Approved March 30th, 1874.*

Every person who collects any tolls, wharfage or dockage, or lands, ships, or removes any property upon or from any portion of the water-front of San Francisco, or from or upon any of the wharves, piers, or landings under control of the State Harbour Commissioners, without being by such Board authorized so to do, is guilty of a misdemeanor.—*Penal Code*, Section 642.

Every person who attempts, by means of any threat or violence, to deter or prevent an executive officer from performing any duty imposed upon such officer by law, or knowingly resists, by the use of force or violence, such officer in the performance of his duty, is punishable by fine not exceeding five thousand dollars, and imprisonment in the County Jail not exceeding five years.—*Penal Code*, Section 69.

Every person who willfully resists, delays, or obstructs any public officer in the discharge, or attempt to discharge, any duty of his office, when no other punishment is prescribed, is punishable by fine not exceeding five thousand dollars, and imprisonment in the County Jail not exceeding five years.—*Penal Code*, Section 148.

Every person who willfully obstructs or hinders any public officer from collecting any revenue, taxes, or other sum of money in which the people of this State are interested, and which such officer is by law empowered to collect, is guilty of a misdemeanor.—*Penal Code*, Section 428.

[Wharfingers and Toll Collectors are public officers.]

Harbour Rules and Regulations made by the Board of State Harbour Commissioners by Authority of an Act approved March 30th, 1874, and to take effect on the 1st day of July, 1874.

[Amendments to 1879.]

RULE 1.—Vessels must not be anchored or moored between a line drawn from the end of Jackson Street Wharf to the most southerly end of Goat Island, and a line drawn from the end of Mission Street Wharf to the point where the southerly end of the Central Pacific Railroad Wharf connects with the Oakland shore, nor must they be anchored in such manner as to permit them to swing between said lines.

RULE 2.—Vessels must not be anchored or moored within five hundred yards of a line drawn from the out-shore end of Meiggs Wharf, southerly along the ends of the wharves, to the out-shore end of Pacific Mail Company's Wharf.

RULE 3.—Vessels must not be moored in such manner as to interfere with vessels approaching or leaving the wharves.

RULE 4.—Vessels will not be entitled to a berth until application is made to the Chief Wharfinger or Assistant Chief Wharfinger. And no application will be entertained unless the vessel is in the harbour, and at anchor; and berths will be assigned in the order of application so made, the applicant giving the draught of vessel, kind of cargo, and locality desired: and in no case must a berth be assigned by a person other than the Chief Wharfinger or Assistant Chief Wharfinger.

RULE 5.—Idle vessels must haul or go into the stream to an anchor at the expense of such vessel, when required to do so by the Chief Wharfinger to make room for vessels requiring immediate accommodations.

RULE 6.—When it is necessary for a vessel to move to allow entrance or exit to other vessels, they must do so at their own expense.

RULE 7.—Vessels, when being moved into a slip or alongside of a wharf, must approach "head on," and when at a wharf must lie head toward the shore. Their studding-sails, booms and spritsail yards must be rigged in; their off shore anchors suspended ready for dropping; their lower and topsail yards braced "sharp up" on their in-shore braces, excepting when in actual use discharging or loading cargo; and when required by the Wharfingers their movable fore-and-aft spars and martingale must be rigged in.

RULE 8.—Vessels ready to discharge cargoes given the preference over those ready to receive cargo.

RULE 9.—Vessels anchored or moored in the harbour, or lying in a slip or dock, must at all times, as well by night as by day, have on board at least one seaman capable of taking proper care of such vessel. If a vessel shall be required to be removed, such vessel may be removed by the wharfingers at the expense of the owner of such vessel, and the owner and the vessel shall be liable for all damage that shall arise thereby.

RULE 10.—When ballast, stones, coals, bricks, ashes, cinders, dust, rubbish, or other loose matter or thing that will sink, is being landed from a vessel upon a wharf or landing, or is being transferred from one vessel into another vessel, a canvas, or shoot, or other contrivance, to the satisfaction of the wharfinger, must be used to prevent any part of such substances from falling into the harbour.

RULE 11.—Fire must not be used on board of any vessel for heating pitch, tar, or other inflammable substance, but may be used on floating stages or boats for the purpose of heating such substances for repairing vessels, provided such fire is constantly in the care of a person capable of taking proper care of the same.

RULE 12.—Every steam engine, when used upon any wharf or landing for loading or unloading cargo, must have upon its smoke-stack a bonnet or spark-catcher that will effectually prevent sparks falling upon such wharf or landing, or upon the deck of any vessel.

RULE 13.—The number of piles or pieces of timber, permitted to be unloaded from the same vessel into any slip or dock before being removed, must not exceed one hundred, and none must remain in a dock or slip during the night without the permission of the wharfinger.

RULE 14.—All condemned or dismantled vessels must be moved to such places as Chief Wharfinger shall designate.

RULE 15.—No substance that will sink or form an obstruction to navigation must be deposited in the waters or on the shore of the Harbour, without first obtaining permission in writing from the Harbour Commissioners.

RULE 16.—All rubbish or other substance landed upon a wharf or landing upon which wharfage is not charged, must be removed therefrom by the party landing the same; and if not removed by such party, will be removed by the wharfinger at the expense of such party. All coal-screens or donkey engines must be removed by owner or agent at the request of the wharfinger.

RULE 17.—All lumber lighters and other lighters or barges not being discharged or empty, must be hauled from the wharf and securely moored in the slip, as may be directed by the wharfinger.

RULE 18.—No vessel will be put upon half rates until permission is given by the Chief or Assistant Chief Wharfinger.

RULE 19.—All vessels coming from leased premises will be charged the same as if coming from the stream.

RULE 20.—Neither the slips, docks, basins or wharves, nor the space in front of them, nor the streets along the water front must be obstructed by any material or structure. If any such obstruction be not removed within twenty-four hours after notice to that effect, such material or structure will be removed, stored or sold by the Commissioners, and twenty-five dollars will be charged for each day that the obstruction has existed, together with the expense of removal, storage or sale.

RULE 21.—No persons are permitted to collect dockage, wharfage, rent or tolls unless authorized by the Harbour Commissioners, and the rates charged by lessees must conform strictly to those fixed by the Commissioners.

RULE 22.—If any vessel leaves any wharf, slip, dock or basin, unless forced to do so by stress of weather, without first paying the dockage due, such vessel will be placed upon the delinquent list, and will not be permitted to use any wharf, slip, dock or basin without first paying double the bill incurred and ten dollars in addition thereto.

RULE 23.—The master, agent or owner of any vessel refusing or neglecting to obey the orders of the Chief or Assistant Chief Wharfinger in any matter pertaining to the regulation of the Harbour, or removal, or stationing of such vessel, is guilty of a misdemeanor, and liable to a fine not exceeding three hundred dollars, or imprisonment not exceeding one hundred days.

Telegraph Cables in San Francisco Harbour.

The following landmarks, or monuments, have been erected to indicate the telegraph cable crossing near Benicia.

On the small island opposite Benicia there is a pole, about ten (10) feet high, with a white sign at the end of the pole, lettered "Telegraph cable crosses here."

There is a similar pole and sign in a small ravine or cove on the Contra Costa shore, nearly opposite said island, a little below it, down stream.

The cable extends from the small island aforesaid to the monument on the Contra Costa side.

Another telegraph cable has been laid between the Market Street wharf, San Francisco, and the Long wharf at Oakland, as nearly as possible in the centre of the *one thousand feet reserved by law for the protection of Ferry boats.*

Masters are requested to keep their anchors clear of this route.

All persons or vessels damaging or breaking these cables, whether by dragging anchors or otherwise, will be promptly prosecuted. The penalty fixed by law is a fine of not less than five hundred nor more than ten thousand dollars, to which are added full damages arising from injury done to the cable.

Passenger Act of the State of California.

The Passenger Act of the State of California requires *all masters or commanders of vessels, arriving from ports outside the State of California*, to make report to the Commissioner of Immigration within twenty-four hours of arrival. This report is to contain the names of all persons or passengers on board who may be naturalized citizens of the United States; also, their age, nativity, occupation, place and date of naturalization. The report must also contain the names, ages, nationality, and occupation of all persons or passengers on board not citizens of the United States. Masters or commanders of vessels are to require all persons claiming to be naturalized citizens to make oath or to affirm the same, giving the time and place where said naturalization took place.

Special bonds are required for all "lunatic, deaf, dumb, blind, crippled, or infirm persons, whose circumstances make it probable they will become a burden on the State." The penalty for non-report is \$200, and \$200 per alien passenger not reported.

REGULATIONS

FOR

PREVENTING COLLISIONS AT SEA.

(To come into operation on September 1st, 1880.)

Art. 1.—In the following rules every steamship which is under sail and not under steam is to be considered a sailing ship; and every steamship which is under steam, whether under sail or not, is to be considered a ship under steam.

RULES CONCERNING LIGHTS.

Art. 2.—Lights.—The lights mentioned in the following Articles, numbered 3, 4, 5, 6, 7, 8, 9, 10, and 11, and no others, shall be carried in all weathers, from sunset to sunrise.

Art. 3.—Lights for Steamships.—A sea-going steamship, when under way, shall carry:—

(a.) ON OR IN FRONT OF THE FOREMAST, at a height above the hull of not less than 20 feet, and if the breadth of the ship exceeds 20 feet then at a height above the hull not less than such breadth, a bright *white light*, so constructed as to show an uniform and unbroken light over an arc of the horizon of 20 points of the compass; so fixed as to throw the light 10 points on each side of the ship, viz., from right ahead to two points abaft the beam on either side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 5 miles.

(b.) ON THE STARBOARD SIDE, a *green light* so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles.

(c.) ON THE PORT SIDE, a *red light*, so constructed as to show an uniform and unbroken light over an arc of the horizon of 10 points of the compass; so fixed as to throw the light from right ahead to two points abaft the beam on the port side; and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles.

(d.) The said *green* and *red* side lights shall be fitted with *inboard screens* projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

Art. 4.—Lights for Steam-tugs.—A steamship, when towing another ship shall, in addition to her side lights, carry two bright *white lights* in a vertical line one over the other, not less than three feet apart, so as to distinguish her from other steamships.

Each of these lights shall be of the same construction and character, and shall be carried in the same position, as the white light which other steamships are required to carry.

Art. 5.—Lights for Telegraph-ships.—A ship, whether a steamship or a sailing ship, when employed either in laying or in picking up a telegraph cable, or which from any accident is not under command, shall at night carry in the same position as the white light which steamships are required to carry, and, if a steamship, in place of that light, three *red lights* in globular lanterns, each not less than 10 inches in diameter, in a vertical line one over the other, not less than three feet apart: and shall by day carry in a vertical line one over the other, not less than three feet apart, in front of but not lower than her foremasthead, three black balls or shapes, each two feet in diameter.

REGULATIONS FOR PREVENTING COLLISIONS AT SEA.

These shapes and lights are to be taken by approaching ships as signals that the ship using them is not under command, and cannot therefore get out of the way. The above ships, when not making any way through the water, shall not carry the side lights, but when making way shall carry them.

Art. 6.—Lights for Sailing-ships.—A sailing ship under way, or being towed, shall carry the same lights as are provided by Article 3 for a steamship under way, with the exception of the white light, which she shall never carry.

Art. 7.—Exceptional Lights for small Sailing-vessels.—Whenever, as in the case of small vessels during bad weather, the green and red side lights cannot be fixed, these lights shall be kept on deck, on their respective sides of the vessel, ready for use: and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the colour of the light they respectively contain, and shall be provided with proper screens.

Art. 8.—Lights for Ships at Anchor.—A ship, whether a steamship or a sailing ship, when at anchor, shall carry, where it can best be seen, but at a height not exceeding 20 feet above the hull, a *white light*, in a globular lantern of not less than eight inches in diameter, and so constructed as to show a clear, uniform, and unbroken light visible all round the horizon, at a distance of at least one mile.

Art. 9.—Lights for Pilot-vessels.—A pilot-vessel, when engaged on her station on pilotage duty, shall not carry the lights required for other vessels, but shall carry a *white light* at the mast-head, visible all round the horizon, and shall also exhibit a *flare-up light* or *flare-up lights* at short intervals, which shall never exceed 15 minutes. A pilot-vessel, when not engaged on her station on pilotage duty, shall carry lights similar to those of other ships.

Art. 10.—Lights for Fishing Vessels and Boats.—(a.) Open fishing boats and other open boats when under way shall not be obliged to carry the side lights required for other vessels; but every such boat shall in lieu thereof have ready at hand a lantern with a green glass on the one side and a red glass on the other side; and on the approach of or to other vessels, such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side, nor the red light on the starboard side.

(b.) A fishing vessel and an open boat, when at anchor, shall exhibit a bright *white light*.

(c.) A fishing vessel, when employed in drift net fishing, shall carry on one of her masts *two red lights in a vertical line one over the other*, not less than three feet apart.

(d.) A trawler at work shall carry on one of her masts *two lights in a vertical line one over the other*, not less than three feet apart, the upper light *red*, and the lower *green*, and shall also either carry the side lights required for other vessels, or, if the side lights cannot be carried, have ready at hand the coloured lights as provided in Art. 7, or a lantern with a red and a green glass as described in paragraph (a) of this Article.

(e.) Fishing vessels and open boats shall not be prevented from using a *flare-up* in addition, if they desire to do so.

(f.) The lights mentioned in this Article are substituted for those mentioned in

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The 12th, 13th, and 14th Articles of the Convention between France and England, schedule 4 to the British Sea Fisheries Act, 1868.

(g.) All lights required by this Article, except side lights, shall be in globular lanterns so constructed as to show all round the horizon.

Art. 11.—*Lights for a ship overtaken by another.*—A ship which is being overtaken by another shall show from her stern to such last-mentioned ship a white light or a flare-up light.

SOUND SIGNALS FOR FOG, &c.

Art. 12.—*Fog Signals.*—A steamship shall be provided with a steam whistle or other efficient steam sound signal, so placed that the sound may not be intercepted by any obstructions, and with an efficient fog-horn to be sounded by a bellows or other mechanical means, and also with an efficient bell. A sailing ship shall be provided with a similar fog-horn and bell.

In fog, mist, or falling snow, whether by day or night, the signals described in this Article shall be used as follows; that is to say,

(a.) A steamship under way shall make with her steam whistle, or other steam sound signal, at intervals of not more than two minutes, a prolonged blast.

(b.) A sailing ship under way shall make with her fog-horn, at intervals of not more than two minutes, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

(c.) A steamship and a sailing ship when not under way shall, at intervals of not more than two minutes, ring the bell.

SPEED OF SHIPS IN FOG, &c.

Art. 13.—*Speed during Fog.*—Every ship, whether a sailing ship or steamship, shall in a fog, mist, or falling snow, go at a moderate speed.

STEERING AND SAILING RULES.

Art. 14.—*Two Sailing Ships meeting.*—When two sailing ships are approaching one another so as to involve risk of collision, one of them shall keep out of the way of the other as follows, viz.:—

(a.) A ship which is running free shall keep out of the way of a ship which is close-hauled.

(b.) A ship which is close-hauled on the port tack shall keep out of the way of a ship which is close-hauled on the starboard tack.

(c.) When both are running free with the wind on different sides, the ship which has the wind on the port side shall keep out of the way of the other.

(d.) When both are running free with the wind on the same side, the ship which is to windward shall keep out of the way of the ship which is to leeward.

(e.) A ship which has the wind aft shall keep out of the way of the other ship.

Art. 15.—*Two Ships under Steam meeting.*—If two ships under steam are meeting end on or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This Article only applies to cases where ships are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two ships which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are, when each of the two ships is end on, or nearly end on, to the other; in other words, to cases in which, by

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day, each ship sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each ship is in such a position as to see both the side lights of the other.

It does not apply by day, to cases in which a ship sees another ahead crossing her own course; or by night, to cases where the red light of one ship is opposed to the red light of the other, or where the green light of one ship is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 16.—Two Ships under Steam crossing.—If two ships under steam are crossing, so as to involve risk of collision, the ship which has the other on her own starboard side shall keep out of the way of the other.

Art. 17.—Sailing Ship and Ship under Steam.—If two ships, one of which is a sailing ship and the other a steamship, are proceeding in such directions as to involve risk of collision, the steamship shall keep out of the way of the sailing ship.

Art. 18.—Ships under Steam to slacken speed.—Every steamship, when approaching another ship, so as to involve risk of collision, shall slacken her speed or stop and reverse, if necessary.

Art. 19.—Optional Signals.—In taking any course authorized or required by these Regulations, a steamship under way may indicate that course to any other ship which she has in sight by the following signals on her steam whistle, viz. :—

One short blast to mean "*I am directing my course to starboard.*"

Two short blasts to mean "*I am directing my course to port.*"

Three short blasts to mean "*I am going full speed astern.*"

The use of these signals is optional; but if they are used, the course of the ship must be in accordance with the signal made.

Art. 20.—Vessels overtaking other Vessels.—Notwithstanding anything contained in a preceding Article, every ship, whether a sailing ship or a steamship, overtaking any other, shall keep out of the way of the overtaken ship.

Art. 21.—Steamships in narrow Channels.—In narrow channels every steamship shall, when it is safe and practicable, keep to that side of the fairway or mid-channel which lies on the starboard side of such ship.

Art. 22.—Vessel to keep her Course.—Where by the above rules one of two ships is to keep out of the way, the other shall keep her course.

Art. 23.—PROVISO TO SAVE SPECIAL CASES.—In obeying and construing these rules due regard shall be had to all dangers of navigation; and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

Art. 24.—NO SHIP, UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS.—Nothing in these rules shall exonerate any ship, or the Owner, or Master, or Crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper look out, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Art. 25.—RESERVATION OF RULES FOR HARBOURS AND INLAND NAVIGATION.—Nothing in these rules shall interfere with the operation of a special rule, duly made by some Local Authority, relative to the navigation of any harbour, river, or inland navigation.

Art. 26.—SPECIAL LIGHTS FOR SQUADRONS AND CONVOYS.—Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for ships sailing under convoy.

TIDE TABLES.

[Extracted from the Admiralty Tide Tables, 1880.]

PLACE.	High Water, Full and Change.	Rise.		PLACE.	High Water, Full and Change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
Central America, West Coast.				California and Oregon.*			
	h. m.	ft.	ft.		h. m.	ft.	ft.
Cabita Bay	3 40	12		Puerto Refugio . .		10	
Port Utria	4 0	12		San Lucas Bay . .	8 28	4	
Cupica Bay	3 30	13		Magdalena Bay . .	8 25	5½	4½
Octavia Bay	3 30	13		Port San Quentin .	9 30	5	
Pinas Bay	3 15	14		— Bartolomé . . .	9 10†	7-9†	
Chepo River	3 40	16		Playa Marie Bay . .	9 20†	7-9†	
Pedro Gonzales, (Trapieli Island . .	3 50	16		Cerros Island . . .	9 10	7-9	
Chamé Bay	4 0	16		Sta. Barbara Island	8 0	8½	
Taboga	4 0	14		San Diego Bay† . .	9 38	5	3½
Panama Road	3 23	15-22	10-16	Ensenada Anchorage	9 0	4†	
Coiba Island	3 10	12†		Santo Tomas . . .	9 0	6†	
Bahia Honda	3 10	12†		San Juan Anchorage	9 40†	5	
Port Nuevo	3 10	12		San Pedro Anch.†	9 45	4½	3½
Parida Island	3 15	10½		San Miguel, (Cuyler Harbour)	9 25	5	4
Nicoya Gulf (Port Herradura)	3 9	10		San Rosa Island . .	9 30†	5†	4†
Port Culebra	3 10	10†		Santa Catalina Is. .	9 35†	5†	4†
Salinas Bay	3 10	10†		Santa Cruz Island .	9 35†	5†	4†
Port San Juan del Sur	3 8†	10†		San Luis Obispo† .	10 8	4½	3½
Port Realejo	3 6	11		Monterey†	10 22	4½	3½
Port la Union, Gulf of Fonseca	3 15	10½	8½	South Farallón† .	10 37	4½	3½
Acajutla Road . . .	2 25	9		San Francisco . .			
San José Road . . .		9	7½	— North Beach† .	0 6	4½	3½
Mexico, West Coast.				Drakes Bay† . . .	11 41	4½	3½
Port Guatulco . . .	1 30	5		Bodega Port† . . .	11 17	4½	3½
„ Sacrificios . . .	3 15	6		Mendocino Bay . .	10 50	5½†	
Acapulco	3 6	1½		Humboldt Bay† . .	0 2	5½	4½
Perula Bay		7		Trinidad Harbour .	11 11	7½	5½
San Blas	9 41	6½		Crescent City . . .	11 44	5½†	
Mazatlan	9 40	7		Port Orford† . . .	11 26	6½	4½
Culiacan River . . .	11 30	6†		Koon Bay	11 26	6½	5½
St. Lorenzo Channel	8 22	4½		Columbia River, Ent.	0 30	3-8	
Guaymas Harbour .	8 0	4		„ Marsh Island . .			
Colorado River . . .	2 15	25-30	16-20	Creek	1 20	4-7	
				Astoria†	0 42	7½	6
				Grays Harbour . . .	0 19	7	5½
				Nes-ah Harbour† . .	0 33	7½	6½
				Port Townshend† .	3 49	5½	5
				Port Steilacoom† . .	4 46	11	9½

* The tides on these coasts are of so complicated a character that the following general explanation is considered necessary:—There are generally in each twenty-four hours, or rather in each lunar day of 24h. 50m., two high and two low waters, which are unequal in height and in time in proportion to the moon's declination, differing most from each other when the moon's declination is greatest, and least when the moon is on the equator. The high and low waters generally follow each other thus: starting from the lowest low water, the tide rises to the lower of the two high waters (sometimes improperly called "half-tide"), then falls slightly to a low water (which is sometimes merely indicated by a long stand); then rises to the highest high water, whence it falls again to the lowest low water.—*Tide Tables for the Pacific coast of the United States.*

† From the United States Coast Survey, the time of High Water being the corrected and not the Vulgar Establishment.

PLACE.	High Water, Full and Change.	Rise.		PLACE.	High Water, Full and Change.	Rise.	
		Spring.	Neaps.			Spring.	Neaps.
<i>Vancouver Island, Juan de Fuca Strait, and British Columbia.</i>				Port Neville	h. m.	ft.	ft.
Sooke Harbour	h. m.	ft.	ft.	Port Harvey (Call Creek)	0 30	17	
Race Islands	2 0	8		Beaver Cove		10	
Esquimalt Harbour* . .	3 0†	8		Alert Bay, Cormorant Island	0 30	15	
Victoria Harbour* . .	irr.	7-10	5-8	Nimkish River	0 30	14	
Inner Channels leading from Juan de Fuca Strait to Haro Strait	irr.	7-10	5-8	Su-quash Anchorage	0 30	16	
Griffin Bay, Haro Archipelago	irr.	10-12		Beaver Harbour†	0 30	16‡	11‡
Roche, Har., Haro St. Port Discovery	irr.	12		Shushartie Bay†		12	
Nisqually, Puget Sd. Fane Island, Plumper Sound	2 30	7		Bull Harbour, Gole-tas Channel†	0 30	12‡	
Drayton Harbour, Semishmo Bay	6 0	18	16	Blunden and Tracey Harbours, Queen Charlotte Sound	noon.	16	11‡
Fraser River (entr.) . .	irr.	12		Cypress Harbour, Sharp Passage	noon.	16	11‡
Burrard Inlet, Gulf of Georgia	6 0	16		Deep Harbour, Fife Sound	noon.	16	11‡
Plumper Cove, Howe Sound†	noon.	12		Cullen Harbour	noon.	16	11‡
Port Gravest	noon.	12		Sunday Harbour and Dusky Cove, Qn. Charlotte Sound	1 0	13	
Stuart Channel, (Oyster Harbour)	6 0	10		Farewell Harbour and Sargeant Passage, Knight Inlet	1 0	15	8
Stuart Channel, (Cowichin Harbour)		10-12		Quatsino Sound, Vancouver Island	11 0	11	12
Maple Bay		12		Klaskino Inlet	noon.	12	
Nanaimo Harbour, Gulf of Georgia	5 0	14		Klaskish Inlet, Vancouver Island	noon.	12	
Nanaimo Harbour, Vancouver Island	5 0	15		Nasparto Inlet, "	noon.	12	
Pender Harbour, Strait of Georgia†	6 0	13		Ou-Ou-Kinah Inlet	noon.	12	
Port Augusta	5 0	12		Kyuquot Sound "	noon.	12	
Hernando Island, (Baker Passage) Strait of Georgia	6 0	12-14		Esperanza Inlet "	noon.	12	
Surge Narrows	6 0	12		Nuchatlitz Inlet "	noon.	12	
Rendezvous Islands . .	7 0	14	12	Nootka Sound "	noon.	12	
Stuart Island	6 0	12-14		Hesquiat Harb. "	noon.	12	
Waddington Harb., Bute Inlet	6 0	13		Clayoquot Sound	noon.	12	
Gowlland Harbour, Discovery Passage	5 30	11		Barclay Sound, Island Harbour	noon.	12	
Seymour Narrows . . .	4 0	11		Stamp Harbour	noon.	12	
Cameleon Harbour, Nodales Channel	3 0	16	11‡	<i>America, North-west Coast.</i>			
Forward Harbour . . .	3 0	16	11‡	Takush Harbour, Smith Inlet	1 0	14	11
Beaver Creek, Loughborough Inlet	3 0	16	11‡	Fitz Hugh Sound, Schooner Retreat	0 30	14	11
Topase Harbour	3 0	16	11‡	" Safety Cove	1 0	14	11
Knox Bay	noon.	16		" Gold-stream Har. . . .	1 0	15	12
				" Namu Harbour	1 0	15	12‡
				" Welcome Harb. . . .	noon.	15-16	12-13
				Port John, Fisher Channel	1 0	13	

* May to October, from Midnight to 3 a.m. November to April from Noon to 3 p.m.

† From observations made in the month of October.

‡ From observations made in May.

PLACE.	High Water Full and Change.	Rise.		PLACE.	High Water Full and Change.	Rise.	
		Springs.	Neaps.			Springs.	Neaps.
	h. m.	ft.	ft.		h. m.	ft.	ft.
McLaughlin Bay, (Lama Passage) .	1 0	14	8	Port Canaveral . .	0 30	18	
Kynumt Harbour .	0 30	14	11	" Stephens . .	0 30	18	
Port Blakeney, Millbank Sound . .	noon.	13	8-10	Qlawdkeet Anchor- age . .	1 30	17-22	14-17
Finlayson Channel, Nowish Cove . .	noon.	12		" Sound . .	1 30	17-22	14-17
Klemtoo Passage, Finlayson Chan- nel	noon.	13	8	Port Simpson . .	1 30	17-22	14-17
Holmes Bay . . .	1 0	13	10	Nass Bay	1 5	23	
Ooghlan Anchorage .	0 30	18	14	Observatory Inlet .	1 5	23	12
Lowe Inlet . . .	0 30	17	15	Portland Inlet . .	1 30	23-27	15-20
Klewngugget Inlet, Grenville Chan- nel	0 30	17		Highfield		16	
Edye Passage (Refuge Bay) . .	1 30	17-22	14-17	Sitka*	0 34	12	2-3
Ogden Channel (Alpha Bay) . .	1 0	20		Behring Bay . . .	0 30	9	
Metiah Catiah, Chatham Sound .	noon.	21	17	Port Etches . . .	1 15	9½	
				" Chalmers . . .	1 0	13½	
				" Chatham . . .	1 0	12	
				Onnalashka Island .	7 30	7½	
				Cape Roshnoff . .	7 30	15	
				Queen Charlotte Islands.			
				Skidegate Inlet . .	1 0	17	14
				Port Kuper . . .	1 40	13	10½

* The tides at Sitka are affected by diurnal inequality.—*The late Rev. W. Whewell on the Tides of the Pacific.*

TABLES OF GEOGRAPHICAL POSITIONS.

	Latitude, N.	Longitude, W.
	° ' "	° ' "
Cape Corrientes, south-west extremity	5 28 46	77 32 38
Alusea point, north extremity	5 36 20	77 29 25
Port Utria, centre of south islet	5 58 30	77 20 20
Solano point, north extremity	6 17 55	77 27 30
Cupica bay, entrance of Cupica river	6 41 19	77 29 36
Cape Marzo, south-east extremity	6 49 45	77 40 0
Port Pinas, north-east bight	7 34 37	78 0 50
Garachine point, north-east extremity	8 6 0	78 21 15
Patena point, centre of islet	8 16 20	78 17 10
Galera island (centre of)	8 11 20	78 45 45
San José bank, Trollope rock	8 6 40	78 37 40
Isla del Rey (south end of)—extremity of Cocos point	8 12 30	78 53 45
„ church of San Miguel	8 27 0	78 55 35
Saboga island, church	8 37 10	79 3 10
Gonzales island, Havannah head	8 25 0	79 5 50
San José island, Iguana point	8 18 25	79 6 30
Brava point, west extremity	8 20 36	78 24 30
Pajaros islands, north-west island	8 32 20	78 32 10
Pelado island (centre of)	8 37 35	78 41 40
Chepillo island, the tree	8 56 32	79 7 0
Panama, south tower of	8 57 6	79 32 12
Flamenco island (north point of)	8 54 30	79 30 20
Bona island, peak	8 33 35	79 34 5
Point Chamé, extremity	8 39 0	79 40 50
Parita bay, Liso point	7 58 10	80 20 40
Iguana island (centre of)	7 37 5	79 59 0
Cape Mala, extremity... ..	7 27 40	79 58 30
South Fraile (centre of)	7 19 30	80 7 10
Morro Puercos, south extremity... ..	7 13 45	80 25 10
Point Mariato, extremity	7 12 0	80 51 30
Naranjas island	7 15 15	80 55 45
Cebaco island, west extremity	7 29 0	81 13 30
Gobernador island (centre of)	7 33 0	81 11 0
Hicarita island, south extremity	7 12 45	81 45 30
Coiba island, extremity of Negada point	7 20 0	81 34 0
„ „ Hermosa point	7 31 0	81 51 0
Montuosa island	7 28 0	82 13 0
Bahia Honda, extremity of cape Jabali	7 42 30	81 30 0
Port Nuevo, Silva de Afuera island	8 4 50	81 47 0
Secas islands, south-western islet	7 57 0	82 1 30

* These geographical positions as far as Coronados islets off port San Diego, California, in lat. 32° 24', are chiefly from the Admiralty charts; the majority of them must be considered only approximately correct, as the coasts of Central America and Mexico have not been minutely surveyed. The longitudes from the gulf of Panama to the Gulf of Fonseca, differ so considerably from the determinations of French surveyors, being generally about 12 miles eastward of the latter, that we have also added a table of the results of the French observations, for which see subsequent pages. A mean of the two may perhaps be correct.

In some cases the geographical positions given in these tables differ from those given in the text, which are from other authorities.

	Latitude, N.			Longitude, W.		
	°	'	"	°	'	"
Viuda rock	8	6	15	82	9	0
Parida island, south-west extremity	8	5	50	82	20	40
Ladrones	7	52	0	82	25	0
Ciudad de David	8	27	0	82	26	0
Burrica island	8	1	0	82	54	40
Gulf of Dulce, extremity of cape Matapalo	8	16	0	88	17	10
„ Arenitas point	8	32	0	88	16	40
„ Golfito point	8	39	30	88	6	30
„ Banco point	8	18	0	88	1	30
Sal-si-puedes point, extremity of	8	23	0	88	34	0
Cano island, centre of	8	40	15	88	51	0
Llorena point, extremity	8	34	0	88	42	30
Judas point, mount Judas	9	31	0	84	28	30
Gulf of Nicoya, Herradura point	9	33	30	84	37	15
„ Calderas bluff	9	53	20	84	39	30
„ Sail rock	9	49	10	84	45	30
„ Pan de Azucar... ..	9	55	48	84	50	2
„ Punta Arenas light	9	53	40	84	46	0
„ Blanco island	9	33	0	85	4	10
Guionos point, extremity of	9	55	0	85	36	40
Cape Velas, islet off	10	19	0	85	50	20
Culebra bay, Gorda point	10	32	0	85	42	40
Cape Elena, extremity of	10	53	10	85	46	30
Salinas bay, Salinas islet	11	8	0	85	39	0
San Juan del Sur, south point of bay	11	15	10	85	49	0
Mount Miravelles or Miravaya	10	39	40	85	0	0
Mount Orosi	10	59	0	85	25	0
Mount Madera	11	27	0	85	27	30
Mount Ometepe	11	32	0	85	34	0
Mount Mombacho	11	46	30	85	54	30
Mount Momotombo	12	25	0	86	27	30
Mount Axusco	12	26	45	86	36	0
Mount Orotá	12	33	0	86	41	0
Mount Telica	12	35	30	86	46	30
Mount Viejo	12	42	0	86	56	30
Realejo, north-west end of Cardon island	12	27	55	87	7	47
Gulf of Fonseca,* Amapala point, extremity	13	8	40	87	54	50
„ Chicarone point	13	17	10	87	47	10
„ La Union	13	20	5	87	51	5
San Miguel volcano	13	26	0	88	17	20
San Miguel river entrance (east point)	13	11	10	88	22	40
San Miguel river entrance (west point)	13	11	0	88	23	35
Jiquilisco bay (east point)	13	9	20	88	27	40
Jiquilisco bay (west point)	13	9	20	88	31	0
Usulután volcano	13	25	30	88	28	40
Lempa river entrance (east point)	13	12	15	88	48	30
Lempa river entrance (west point)	13	12	30	88	49	55
San Vicente volcano... ..	13	34	20	88	52	0
Concordia river (centre of entrance)	13	20	30	89	4	0
Jiboa river (centre of entrance)... ..	13	21	25	89	5	40
San Salvador volcano	13	48	10	89	16	10
Libertad	13	20	0	89	10	20

* The geographical positions here given from the Gulf of Fonseca (inclusive) to Acajutla or Sonsonate road are approximate determinations by Com. J. W. Philip, of U.S.S. *Tuscarora*, 1860.

	Latitude, N.			Longitude, W.		
	°	'	"	°	'	"
Remedios reef (south point)	18	29	10	89	50	25
Bodegas or Acajutla light	18	34	20	89	50	45
San José, the beach	18	53	0	90	49	0
St. Luis	14	18	0	91	47	0
Champerico, white flagstaff	14	20	0	91	57	0
San Benito	14	48	0	92	30	0
Soconusco bluff, Double-headed volcano at the back of bluff	15	54	0	93	39	0
San Francisco bar, village on the beach	16	18	0	94	40	0
Ventosa bay	16	10	30	95	16	0
Morro Ayuca, the point	15	51	56	95	43	56
Guatulco, port	15	45	0	95	4	0
Sacrificios, point	15	43	0	96	12	0
Maldonado or Escondido point	16	18	40	98	32	0
Acapulco, San Diego fort gate	16	50	56	99	52	15
Sihuatanajo	17	38	3	101	30	52
Mangrove bluff	17	54	5	102	12	41
Lizard point	18	11	0	103	5	0
Black head	18	36	18	103	41	51
Mount Colima	19	24	42	103	33	1
Manzanilla bay, west end of village	19	8	13	104	17	41
Piedra Blanca, islet of	19	6	0	104	27	30
Navidad bay, cape Graham	19	10	30	104	40	30
Perula bay, riviera point	19	34	31	105	6	33
Cape Corrientes, extreme point of	20	25	0	105	39	21
Corventena rock	20	44	10	105	47	30
Maria islands, south-east island	21	20	0	106	13	0
" San Juanito, the north-west island	21	45	0	106	38	0
San Blas, arsenal	21	32	24	105	15	27
" Piedra del Mar	21	34	45	105	27	30
Isabel island	21	51	15	105	51	45
Chamatla river	22	50	0	105	53	0
Mazatlan, south bluff of Creston island	23	11	40	106	23	0
Piastla river, entrance	23	42	20	106	45	0
Culiacan (Altata) river, entrance	24	36	36	107	53	0
Ignacio point,	25	36	0	109	20	0
Ignacio island,	25	26	0	109	21	0
Agiabampo, cross on the hill	26	16	18	109	15	0
Lobos point, extremity	27	17	0	110	39	0
Guaymas, cape Haro	27	50	30	110	51	40
" Almagrito island	27	53	50	110	49	26
Angeles island, north end	29	33	0	113	30	0
River Colorado, Montague island at entrance	31	44	0	114	45	0
San Marcos island, centre	27	13	0	112	2	0
Mulego bay, entrance	26	53	0	111	50	0
Loreto village	26	1	0	111	18	0
Pulpito anchorage, point	26	30	50	111	24	0
Mangles anchorage, point	26	16	30	111	20	0
Carmen island, shore of Salinas bay	25	59	34	111	4	0
Montserrat island, centre	25	41	0	110	59	0
Catalina island, north end	25	0	0	110	44	0
San Jose island, north end of Amortajada bay	24	54	30	110	35	23
Animas rocks	25	6	0	110	27	0
Espiritu Santo island, west end of Gallo islet (port Ballena)	24	28	0	110	21	0

	Latitude, N.			Longitude, W.		
	°	'	"	°	'	"
Espiritu Santo island, south point of San Gabriel bay	24	25	0	110	19	0
San Juan Nepomezeino, south end of	24	16	5	110	18	15
Ceralbo island, south end	24	9	0	109	50	0
„ north end	24	22	0	109	56	0
San Jose del Cabo bay, Salatea village	28	3	15	109	37	52
Cape San Lucas, west end of Frayles rocks (San Lucas bay)	22	52	14	109	52	8
Magdalena bay, east side of cape Corso	24	38	18	112	6	21
Cape San Lazaro	24	48	20	112	16	28
Ballenas bay, Abrejos point	26	48	0	118	36	0
Asuncion island	27	8	0	114	24	0
San Bartolome bay, north-west point	27	39	53	114	54	10
Morro Hermoso	27	52	0	115	7	0
Natividad island, east end	27	52	30	115	11	45
Cerros island, north end	28	19	0	115	14	0
San Benito island, westernmost	28	15	30	115	33	15
Playa Maria bay, west point	28	55	37	114	31	20
Geronimo island	29	40	0	115	44	0
San Quentin, west side of entrance	30	21	53	115	56	33
Colnett bay	30	59	45	116	16	22
Coronados islets,* highest and largest	32	28	46	117	13	21
San Diego, U.S. boundary obelisk	32	31	59	117	6	11
„ lighthouse on point Loma	32	40	13	117	12	22
San Clemente, north-west extremity of the island	33	2	0	118	34	0
Cortez shoal, the Bishop rock	32	25	45	119	5	0
San Nicolas, south-east end of the island	33	14	12	119	25	0
Santa Catalina, the great transverse break of the island, (north side)	33	26	35	118	28	45
Santa Barbara island	33	30	0	119	2	0
San Pedro bay, edge of bluff at the landing	33	43	20	118	16	3
Anacapa, eastern point of the island	33	1	0	119	19	0
Point Hueneme	34	8	0	119	9	0
Prisoner's harbour, north side of Santa Cruz island	34	1	10	119	40	0
Cuyler's harbour	34	8	0	120	20	27
Santa Barbara, lighthouse	34	23	35	119	42	5
„ town, at the landing	34	24	25	119	40	18
Point Concepcion, lighthouse	34	26	47	120	27	0
Point Arguello	34	34	0	120	38	0
San Luis Obispo bay, the small gully west of the creek	35	10	38	120	43	31
San Simeon bay, near the landing	35	38	24	121	10	22
Piedras Blancas, outer one	35	39	0	121	15	0
Point Sur	36	19	0	121	52	0
Point Pinos, lighthouse	36	37	52	121	55	0
Santa Cruz harbour, the landing place	36	57	27	122	0	10
Point Ano Nuevo	37	7	0	122	19	0
Point San Pedro	37	35	45	122	30	34
Farrallon, lighthouse	37	41	40	122	59	5
San Francisco, Point Lobos, S. head of entrance to San Francisco bay	37	46	51	122	29	40

* The geographical positions from Coronados islets northward to the north point of Lumm Island in Haro archipelago, are from the observations of the U.S. Coast Surveyors.

The positions given in this table of places in the Gulf and on the Coast of Lower California differ slightly from the more recent determinations of Commander G. Dewey, U.S.S. *Narragansett*; see supplementary table No. 2, on a subsequent page.

	Latitude, N.	Longitude, W.
	" ' "	" ' "
San Francisco, Rincon point, N.W. of South park,		
San Francisco bay	37 47 7	122 22 32
" Telegraph hill, near the " San Fran-		
cisco Observatory"	37 47 58	122 28 10
" Fort point lighthouse	37 48 81	122 27 38
" Point Bonita lighthouse	37 49 4	122 30 50
" Alcatraz island light	37 49 27	122 24 19
Punta de los Reyes, landing in Drake's bay	37 59 85	122 57 36
" lighthouse*	37 59 89	123 0 13
Bodega bay, west end of Sandy point	38 18 20	123 2 17
Haven's anchorage, the bluff at the landing	38 47 58	123 84 1
Mendocino bay, the bluff near the landing	39 18 6	123 47 26
Punta de Arena, N.W. extremity of the point	38 57 0	123 45 0
Shelter cove, (point Delgado), the bluff near the landing	40 1 14	124 8 3
Cape Mendocino, extremity of cape	40 25 0	124 22 0
Humboldt bay, Red bluff	40 44 40	124 10 30
" lighthouse	40 46 4	124 12 21
Bucksport, town	40 46 37	124 10 44
Trinidad, town	41 3 20	124 8 3
Crescent City, lighthouse	41 44 84	124 11 22
Port Orford, the bluff W. of the town	42 44 22	124 30 40
Cape Orford, extremity of the cape	42 50 0	124 38 2
Cape Gregory or Arago, lighthouse	48 20 88	124 22 11
Umpquah, a mile from entrance to the river, (W. side)	43 41 45	124 9 57
Cape Perpetua, middle part of the headland	44 19 0	124 6 0
Cape Lookout, point farthest west	45 20 0	124 0 0
Cape Meares, N.W. part	45 30 0	123 58 0
Cape Falcon, or False Tillamook, northern part	45 47 0	123 58 0
Tillamook head	45 58 0	123 59 0
Astor point, near Astoria, Columbia river... ..	46 11 28	123 49 32
Point Adams	46 12 30	123 56 56
Cape Disappointment, lighthouse	46 16 33	124 2 13
Leadbetter point	46 36 45	124 0 45
Cape Shoalwater, lighthouse	46 44 11	124 2 24
Point Hanson	46 53 44	124 6 54
Olympia, end of wharf	47 8 0	122 55 0
Point Grenville, point of the bluff at the anchorage	47 20 44	124 14 54
Destruction island, north point	47 41 0	124 25 0
Flattery rocks, north-western rocky islet	48 12 0	124 48 0
Tatoosh island, lighthouse	48 28 15	124 48 50
Neé-ah bay, near the creek	48 21 49	124 37 12
Port Angelos, head of the bay	48 7 52	123 27 21
New Dungeness, lighthouse	48 10 59	123 6 7
Smith island, lighthouse	48 19 11	122 50 11
Point Wilson lighthouse	48 8 43	122 45 5
Port Townshend, extremity of point Hudson	48 7 8	124 44 26
Admiralty head, lighthouse	48 9 22	122 40 8
Port Gamble, East point	47 51 32	122 38 53
Restoration point, Admiralty inlet	47 35 6	122 28 15
Lummi, Sand point on the N.E. side of the island	48 44 2	122 40 37

* The geographical positions of lighthouses on the coast of the United States given in this table (extracted from the *U.S. Coast Pilot* 1889) will be found to differ slightly from those given in the text, which are taken from the U.S. Lighthouse list for 1880, published by the Lighthouse Board.

	Latitude, N.	Longitude, W.
VANCOUVER ISLAND AND COAST ADJOINING.*		
Discovery island, east point	48 25 20	128 18 40
Trial islands, south point	48 23 80	128 18 45
Victoria harbour, Laurel point	48 25 22	128 28 2
Esquimalt harbour, Duntze head	48 25 49	128 26 45
Albert head, extremity	48 23 7	128 20 0
Race islands, lighthouse	48 17 45	128 32 15
Beechey head, extremity	48 18 80	128 39 80
Sooke inlet, Secretary island	48 19 85	128 42 40
Sherringham point, extremity	48 22 80	128 55 50
Port San Juan, Pinnacle rock on north side of bay ...	48 38 80	124 27 37
Bonilla point, extremity	48 35 80	124 44 80
Tsusiat waterfall	48 41 80	124 58 0
Barclay sound, extremity of cape Beale	48 47 48	125 12 52
„ Observatory islet, in Island harbour	48 54 41	125 16 54
„ Observatory islet, in Stamp harbour,		
Alberni canal	49 18 46	124 50 7
Portland point, Gowlland rocks	49 8 80	125 51 80
Point Cox, Vargas cone	49 5 80	125 52 80
Clayoquot sound, Observatory island in Hecate bay	49 15 22	125 56 17
Refuge cove, village on west side	49 20 50	126 16 40
Hesquiat harbour, Boat cove	49 27 81	126 25 27
Estevan point, south extremity	49 22 7	126 32 32
Nootka sound, Observatory islet in Friendly cove ...	49 35 81	126 37 32
Nuchatlitz inlet, North-west cone on Ferrer point ...	49 44 50	126 58 50
„ Colwood islet in port Langford	49 47 20	126 57 5
Esperanza inlet, Observatory rock in Queen cove ...	49 52 45	126 59 55
„ Tat-chu point	49 51 80	127 10 0
Kyuquot sound, the shingle point at entrance of Nar-		
rowgut creek	49 59 55	127 9 80
Barrier islands, Highest islands	49 57 45	127 21 80
Nasparti inlet, Sullivan reef	50 4 80	127 41 0
„ beach at its head	50 11 21	127 37 58
Cape Cook, Salander islet	50 6 81	127 57 20
Klaskino inlet, Nob point	50 17 15	127 52 0
Quatsino inlet, Observatory rock in North harbour ...	50 29 25	128 8 39
„ Observatory islet in Koprino harbour	50 30 0	127 52 16
„ Kitten islet in Hecate cove	50 32 26	127 36 18
Cape Scott, summit of cape	50 46 41	128 26 45
Scott islands, west point of Triangle island	50 51 53	129 6 32
Hope island, north point of Indian island in Bull		
harbour	50 54 47	127 56 8
Goletas channel, islet in centre of port Alexander ...	50 50 49	127 39 57
Beaver harbour, Shell islet	50 42 36	127 25 7
Cormorant island, Yellow bluff in Alert bay	50 35 2	126 57 80
Port Harvey (<i>British Columbia</i>), Tide pole islet ...	50 38 58	126 16 40
Port Neville (<i>British Columbia</i>), Robbers nob... ..	50 31 9	126 4 21
Thurlo island, stream at head of Knox bay	50 24 15	125 39 0
Quathiasky cove, South point of island of Valdes island	50 2 42	125 14 38
Baynes sound, Beak point in Henry bay	49 36 29	124 51 18

* These longitudes, from the Admiralty charts, are dependent upon Duntze head, Esquimalt harbour, being in long. 123° 26' 45" W.

	Latitude, N.	Longitude, W.
	° ' "	° ' "
Nanoose harbour, Entrance rock	49 15 48	124 8 6
Howe sound (<i>British Columbia</i>), Plumper cove ...	49 24 39	123 29 20
Burrard inlet (<i>British Columbia</i>), English bay, Government reserve	49 16 18	123 12 0
Fraser river entrance (<i>British Columbia</i>), Military barracks at New Westminster	49 18 1	122 54 26
Fraser river entrance (<i>British Columbia</i>), Garry point	49 7 4	123 12 1
Point Roberts (<i>British Columbia</i>), Parallel station, west side	49 0 0	123 5 26
Semiahmoo bay (<i>British Columbia</i>), Parallel station	49 0 0	122 45 30
Nanaimo harbour, Dr. Benson's house	49 10 15	123 56 36
Fort Simpson, Dixon sound	54 33 35	130 22 49
Portland canal, entrance	54 42 0	130 25 0
Tongas harbour, anchorage	55 3 0	131 25 0
Wrangle island, Etolin harbour	56 31 30	132 20 0
Stikine river, south-east point of entrance	56 40 0	132 20 0
Mount Edgecumbe, on west side of Sitka sound ...	57 2 48	135 40 6
Sitka, U.S. Coast Survey astronomical station ...	57 2 52	135 17 45
Sitka, cupola of governor's house	57 2 47	135 17 8

THE ISLANDS OFF THE COAST.

Cocos island, Chatham bay	5 32 57	86 58 22
Malpelo island	4 0 0	81 32 0
Clipperton rock	10 17 0?	109 10 0?
Socorro island, Braithwaite bay	18 42 57	110 56 53
San Benedicto island	19 19 0	110 49 0
Roca Partida	19 0 0	112 7 0
Clarion island, east side of Sulphur bay	18 20 30	114 45 0
Alijos rocks	24 57 25	115 47 30
Guadaloupe, north point	29 10 50	118 18 30?
Queen Charlotte islands, extremity of cape St. James	51 57 0	131 4 0?
" " Forsyth point in Stewart channel	52 9 7	131 9 0
" " Cumsheawas island on the north side of entrance to Cumsheawas harbour ...	58 1 0	131 22 0
" " Rock on bar of Skidegate bay	58 22 0	131 39 0
" " Rose spit point	54 18 0	131 22 0?
" " Bar of Masset harbour	54 2 0	132 0 0
" " Cape Edensaw in Virago sound	54 4 0	132 14 0
" " North point of North island	54 20 0	133 0 0?
" " Cape Knox	54 15 0	133 8 0
" " Sansum island in port Kuper	52 56 31	132 9 40

	Latitude, N.	Longitude, W.
Gulf of Dulce, house of the French Co., at Punta Arenitas	8 32 22	88 26 4
* Gulf of Nicoya, cape Blanco islet	9 34 0	85 9 14
" " " " " " " " " " " " " " " "	9 34 15	85 13 51
Custom-house at Punta Arenas, gulf of Nicoya ...	9 56 45	84 59 12
Miravelles volcano (<i>position very doubtful</i>)	10 39 40	84 13 51
Orosi volcano, 8665 feet	10 57 14	85 25 58
San Juan del Sur, house of the American Co.	11 15 25	86 0 57
Ometepe volcano, 5008 feet	11 41 45	85 26 86
Madera volcano, 4104 feet	11 84 0	85 2 21
Mombacho volcano, 4501 feet	11 55 25	85 57 11
* Momotombo volcano, 8996 feet	12 26 24	86 89 87
" " " " " " " " " " " " " " " "	12 26 48	86 84 58
* Telica volcano, 8187 feet	12 34 46	86 54 7
" " " " " " " " " " " " " " " "	12 31 55	86 55 11
* Las Pilas volcano, 8015 feet	12 28 24	86 48 7
" " " " " " " " " " " " " " " "	12 35 40	86 47 44
* Viejo volcano, 5898 feet	12 48 14	87 4 47
" " " " " " " " " " " " " " " "	12 47 7	87 2 11
Realejo, north-west extremity of Cardon island ...	12 27 17	87 18 42
* Coseguina volcano, 2848 feet ?	18 0 0	87 37 19
" " " " " " " " " " " " " " " "	12 59 0	87 40 51
Point Consequina	12 59 30	87 50 51
Gulf of Fonseca, M. Dardano's house at Amapala (Tigre island)	18 18 58	87 45 1
* Tigre island, summit, 2986 feet	18 18 0	87 42 46
* Amapala volcano, 4844 feet	18 18 19	87 54 34
" " " " " " " " " " " " " " " "	18 18 0	87 57 51
Port Jiquilisco	18 12 0?	88 28 51?
* San Miguel volcano, 6529	18 25 80	88 17 21
" " " " " " " " " " " " " " " "	18 26 45	88 19 57
* San Vincente volcano, 6928	18 35 0	88 59 6
" " " " " " " " " " " " " " " "	18 36 20	88 59 9
* River Lempa, entrance	18 18 9	88 50 18
" " " " " " " " " " " " " " " "	18 11 0	88 50 51
Mount Virola	18 26 0	88 32 51
* Port Libertad	18 26 30	89 22 51
" " " " " " " " " " " " " " " "	18 28 30	89 22 51
* San Salvador volcano, 6480 feet	18 43 30	89 21 21
" " " " " " " " " " " " " " " "	18 49 10	89 19 1
* Point Remedios	18 34 30	89 58 11
* Isalco volcano, 4973 feet	18 47 0	90 45 51
" " " " " " " " " " " " " " " "	18 50 13	89 44 26

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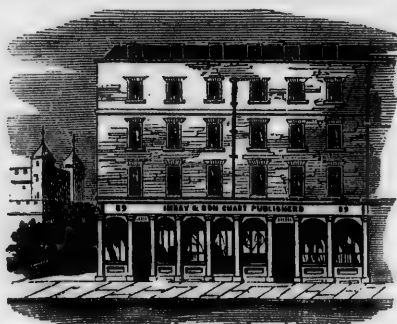
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26. **ENGLAND and SCOTLAND (the Coast included between Flamborough Head and the Orkneys),** being the three southern sheets of chart No. 220. With plans of all the principal harbours included within its limits. With a Book of Directions 12/-

On cloth for Captains' use 15/9

On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. 31/6

27. **ENGLAND and SCOTLAND (East Coast of), from Flamborough Head to the Orkney Islands,** with plans of Harbours, and a full description of the signals exhibited at Sunderland and Hartlepool. Compiled from recent surveys. One sheet. A reduction of chart No. 220 4/-

On cloth for Captains' use 5/3

221. **ENGLAND and SCOTLAND (the Coast included between Flamborough Head and the Firths of Forth and Tay).** Compiled from recent surveys. With plans of Scarborough, Filey bay, Tees bay and Hartlepool. Seaham, Sunderland, the entrance to the Tyne, Blyth, Berwick, Farn Islands, Holy Island harbour, Coquet island and channel, Leith harbour, Dundee, Arbroath and Montrose. Accompanied with a Book of Directions 14/-

On cloth for Captains' use 19/-

This magnificent chart is on four large sheets, and shows the coast on the largest scale yet published, the scale being 18½ inches to a Degree of Longitude. With charts Nos. 8 and 22 it shows the navigation between the Downs and the Firth of Tay; or with Nos. 20 or 21, the navigation between the English Channel and the coast of Scotland as far northward as Montrose; or it may be taken as an accompaniment to chart No. 38. Shipmasters proceeding to Leith or Dundee are also recommended to provide themselves with chart No. 29.

- 222. COAL PORTS of YORKSHIRE, DURHAM, and NORTHUMBERLAND.** The coast of England included between Flamborough head and Coquet island; being the two southern sheets of chart No. 221. With plans of Whitby, Scarborough, the entrance to the Tees and Hartlepool bay, Seaham, Sunderland, the entrance to the Tyne, Blyth, and Coquet roadstead ... 8/-

On cloth for Captains' use ... 10/6

This is a very useful publication for shipmasters bound from southward to any of the ports between Bridlington bay and Warkworth. It is a convenient accompaniment to charts Nos. 8 or 10, with 21 or 22; or it may accompany chart No. 38.

- 29. FIRTHS of FORTH and TAY.** This chart of the rivers is on a very large scale and contains plans of the harbours of Leith, Granton, Burntisland, Anstruther, Crail, Pittenweem, Kirkcaldy, Dysart, Buckhaven, Elie, St. Andrews, Dundee, Arbroath, &c. &c. Accompanied by a Book of Sailing Directions, which contains Coloured Drawings of the Signals used at the various Ports. On two sheets ... 8/-

On cloth for Captains' use ... 10/6

- 30. FIRTHS of FORTH and TAY.** With plans of Leith roadstead, and several of the most important Harbours. On one sheet, and on a much smaller scale than Chart No. 29. Accompanied with a Book of Sailing Directions ... 5/-

- 31. WEST COAST and ISLANDS of SCOTLAND** (from the Mull of Cantyre to Cape Wrath and the Lewis Islands). On three large sheets. With plans of harbours. Accompanied with a Book of Directions ... 12/-

On cloth for Captains' use ... 15/9

- 32. NORTH COAST of SCOTLAND** (Cape Wrath to Pentland Firth) including the Orkney Islands. One large sheet ... 5/-

On cloth for Captains' use ... 6/3

- 19. FIRTH of CLYDE and NORTH CHANNEL,** showing the navigation along the north coast of Ireland, and from the Irish Channel to Glasgow and Greenock. Drawn from recent Admiralty surveys and improved by the introduction of several plans of harbours. On two large sheets ... 8/-

On cloth for Captains' use ... 10/6

On cloth and rollers for Counting-house, coloured and

varnished; size 4 ft. 4 in. by 3 ft. 5 in. ... 24/-

- 13. BRISTOL CHANNEL** (Hartland Point and the Smalls to Bristol and Gloucester). On three large sheets. Drawn from recent Admiralty surveys, and accompanied with a Book of Directions ... 10/-

On cloth for Captains' use ... 13/9

On cloth and rollers for Counting-house, coloured and

varnished; size 5 ft. 2 in. by 3 ft. 3 in. ... 31/6

- 14. IRISH (or St. GEORGE'S) and BRISTOL CHANNELS** (Trevose Head, Cornwall, to the Firth of Clyde), with numerous plans of harbours, and illustrated with views of the coast, lighthouses, beacons, &c. On three large sheets. Drawn from recent Admiralty surveys, and accompanied with a Book of Directions ... 12/-

On cloth for Captains' use ... 15/9

On cloth and rollers for Counting-house, coloured and

varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

- 261. IRISH AND BRISTOL CHANNELS.** The same chart as No. 14, but with a Supplementary Sheet to show the navigation southward, round Cornwall and the Scilly Islands, as far eastward as Plymouth and Dartmouth. With plans of harbours, and of the Longships rocks. Limits: latitude $49^{\circ} 36'$ to $56^{\circ} 1' N$, longitude $2^{\circ} 32'$ to $7^{\circ} 20' W$. With a Book of Directions ... 14/-

* * * This chart, with No. 4, will show the navigation from the Downs to Bristol, Cardiff, Dublin, Liverpool, Belfast, and Glasgow.

- 15. IRELAND** (The West, South-West, and North Coasts of), from Waterford to Lough Foyle. An accompanying chart to that of the Irish Channel, Nos. 14 or 261 preceding. Compiled from recent Admiralty surveys. With a Book of Directions. On three large sheets ... 12/-

On cloth for Captains' use ... 15/9

On cloth and rollers for Counting-house, coloured and

varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

- 16.* **NAVIGATION round IRELAND**, with numerous plans of harbours. With Sailing Directions ... 12/-
On cloth for Captains' use ... 17/-
On cloth and rollers for Counting-house, coloured and varnished ... 31/6
- * This publication (No. 16) was formerly issued in this form only, but its size being very inconvenient, it is now also arranged in two charts. An advantage which follows from this is, that we are enabled to give more plans of harbours than hitherto. The chart is divided into two, as follows (Nos. 17 and 18), but in this form is not accompanied with a Book of Directions. A Book for each chart can be had if required, at an extra charge.
17. **IRISH CHANNEL**. With plans of Belfast, North Rocks, Maidens, &c., Tuskar Rocks, Skerries Rocks, &c., Milford Haven, South Coast of Man, and entrance to Lough Foyle... 5/-
On cloth for Captains' use ... 7/6
18. **West Coast of IRELAND**. With plans of Clew Bay, Broadhaven, Killala Bay, Killybegs, Sligo Harbour, Teelin Harbour, Kinsale, Galway Harbour, Tralee Bay, Valentia Harbour, and Crookhaven ... 5/-
On cloth for Captains' use ... 7/6
206. **ENGLAND and SCOTLAND PILOT**. Containing the following Charts, viz. :—No. 1, The River Thames. No. 2, The East Coast of England, from Orfordness to Flamborough Head. No. 3, The East Coast of England and Scotland ... 10/-

North Sea, Kattegat, and Baltic.

36. **NORTH SEA**, on two large sheets, showing the navigation between the coasts of England and Scotland, and the opposite coasts of France, Holland, Jutland, and Norway. With plans of harbours. Illustrated with numerous views of the Lighthouses. Accompanied with a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6
37. **NORTH SEA**. The same chart as the preceding, but with the addition of a half sheet to show the coast of Norway as far as Drontheim. Illustrated with numerous views of the coast, and improved by a full description of the Currents, Tides, &c., and remarks on the passage across the North Sea. Accompanied with a Book of Directions ... 10/-
On cloth for Captains' use ... 13/9
38. **SOUTHERN PART of the NORTH SEA** from Dungeness to Flamborough Head on the English side; with the opposite coasts of France, Holland, and Germany, from Calais to Hamburg. With plans of Bridlington and Dover bays, the Downs, Dunkerque Roads, Flushing Roads, the entrance to the Hook of Holland Canal, port Ymuiden, the Texel Channels, Helgoland, and entrance to the river Elbe. On three sheets. Accompanied with a Book of Directions ... 12/-
On cloth for Captains' use ... 15/9
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
217. **ENGLAND to GRONINGEN**, being two sheets of Chart No. 38. With plans of Bridlington and Dover bays, the Downs, Flushing Roads, port Ymuiden, and entrance to the Hook of Holland Canal ... 8/-
- 39.* **FLEMISH BANKS, &c.** A large chart, on two sheets, showing the navigation between the River Thames and the ports on the north coast of France (Calais, Ostende, Dunkerque, &c.), the River Schelde to Antwerp, Rotterdam, &c. It comprises the North Sea south of latitude 52° 23' N., and is accompanied with a Book of Sailing Directions ... 8/-
On cloth for Captains' use ... 10/6
- 40.* **NORTH SEA (Rivers Thames and Maas to the Texel)**. A large chart, on two sheets, showing the navigation north of the chart of the Flemish Banks, &c., just described, and comprising all the sea included between Orfordness and Yarmouth Roads and the Texel ... 8/-

- 41.* **NORTH SEA** (Coast of Holland and Prussia from the Texel to Hamburg). A chart, on three large sheets, showing the entrances to the Rivers Elbe, Weser, Ems, Jade, and Hever. Compiled from recent surveys. Accompanied with a Book of Directions 12/-

On cloth for Captains' use 15/9

On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 8 in. by 3 ft. 6 in. 31/6

* The charts Nos. 39, 40, 41 are on the same scale, and show the navigation from the English Channel to Hamburg. They form a complete series of charts of the North Sea southward of Hamburg.

42. **SKAGERRAK, or SLEEVE**, extending from the Naze of Norway to Gothenburg. On a large scale. With numerous plans of harbours. Illustrated with views of Beacons and Headlands. On two sheets 8/-

On cloth for Captains' use 10/6

228. **ENTRANCE TO THE KATTEGAT**. A large chart on 24 sheets, showing the navigation between Christiania and Anholt island. With plans of the approach to Frederikstad, entrance to Gullmar and Aby fiords, entrance to Marstrand fiord, Gothenborg bay, Kongsbacka fiord, Nidingen island and reefs, &c. With a Book of Directions. Limits: latitude $56^{\circ} 41'$ to $60^{\circ} 5' N$, longitude $9^{\circ} 23'$ to $13^{\circ} 27' E$ 10/-

On cloth for Captains' use 13/9

229. **THE BELTS AND SOUND**. A large chart on two sheets, showing the navigation between Anholt island and the ports of Apenrade, Flensburg, Schlesvig, Eckernforde, Kiel, Neustadt, Elsinore (Helsingor), Copenhagen, Malmo, Travemunde, Wismar, Rostock, Stralsund, &c. &c. With plans of harbours. Accompanied by a Book of Directions. Limits: latitude $53^{\circ} 53'$ to $56^{\circ} 52' N$, longitude $9^{\circ} 23'$ to $13^{\circ} 27' E$ 8/-

On cloth for Captains' use 10/6

These two charts (Nos. 228, 229) are on the same scale, and are intended to accompany each other. They show the navigation between Christiania fiord and the port of Kiel; consequently, the route through the Kattegat into the Baltic.

43. **KATTEGAT** (the navigation between the Skaw and Elsinore). Compiled from recent Danish surveys. On two large sheets. Illustrated by numerous views of the coast, and accompanied with a Book of Sailing Directions 8/-

On cloth for Captains' use 10/6

44. **KATTEGAT, SOUND AND BELTS**. A large chart on three sheets, showing the navigation from Skagen point through the Belts and Sound into the Baltic. With plans of the principal harbours. Accompanied by a Book of Directions. Limits: latitude $53^{\circ} 53'$ to $58^{\circ} 10' N$, longitude $9^{\circ} 23'$ to $13^{\circ} 27' E$ 12/-

On cloth for Captains' use 15/9

This chart is three sheets of the charts Nos. 228 and 229. It is published in this form as a convenient accompaniment to the chart of the Skagerrak (No. 42).

45. **THE BELTS**. A large chart, on two sheets, showing the navigation from the Kattegat into the Baltic. This chart is on the same scale as that of the Kattegat (No. 43), and is intended to accompany that chart. It is for the use of such Shipmasters as prefer the wide and clear navigation through the Great Belt to the nearer but more confined passage into the Baltic through the Sound. Accompanied with a Book of Directions 8/-

On cloth for Captains' use 10/6

46. **SOUND**. On two large sheets. With plans of the Channel of Elsinore, and the Channel of Copenhagen. Compiled from recent surveys 7/-

On cloth for Captains' use 9/6

47. **BALTIC (the Sound to the Gulf of Finland and Gulf of Bothnia)**. With plans of harbours. Drawn from the latest surveys made by order of the Governments of Germany, Sweden, Denmark, and Russia. On two large sheets. A new chart. Accompanied with a Book of Directions 8/-

- 48.† **BALTIC (South Part of)**, on three large sheets, and with many plans of harbours. Shows the navigation from the Sound to Danzig, Pillau, Memel, the south end of the island of Gotland, &c. Limits: latitude $53^{\circ} 45'$ to $57^{\circ} 13' N$; longitude $12^{\circ} 0'$ to $21^{\circ} 55' E$. With a Book of Directions 10/-

- 49.† **BALTIC (North Part of)**, on three large sheets, on the same scale as the preceding chart, and with many plans of harbours. It shows the navigation from the south end of Gottland to Riga, the Gulfs of Finland and Bothnia, Stockholm, &c. Limits: latitude $56^{\circ} 52'$ to $60^{\circ} 5' N.$, longitude $16^{\circ} 0'$ to $25^{\circ} 55' E.$... 10/-
- 50.† **GULF of BOTHNIA**, on 2½ large sheets. With plans of the North Quarken and the harbours of Gamla Carleby, and Hudiksvall. Compiled from the recent surveys made by order of the Swedish Government. Accompanied with a Book of Directions ... 10/-
- 51.† **GULF of BOTHNIA (South of the North Quarken)**. A large chart on three sheets, on the same scale as the preceding charts (North and South Baltic, Nos. 48 and 49) and intended to accompany them. With plans of harbours, and accompanied with a Book of Directions ... 10/-
- 223.† **GULF OF BOTHNIA (North of the North Quarken)**. This chart shows the navigation from Umea to Tornea and Uleaborg, at the head of the gulf, and is on the same scale as charts No. 48, 49, and 51. On two large sheets. With a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6
- 52.† **GULF of FINLAND**, on three large sheets, showing the whole navigation between Dager-ort and St. Petersburg. With plans of Kronstat, Port Baltic or Rager Wik, Revel and Hango Harbours. Illustrated with numerous views of the coast, and accompanied with a Book of Directions ... 10/-

† These are all new charts, engraved in the best and clearest style. They show the navigation from the North Sea to the Gulf of Bothnia or Gulf of Finland on the largest scale yet published. Shipmasters bound to St. Petersburg should provide themselves with Nos. 37, 42, 43, 45, 46, 48, 49 and 52; or, if bound to the Gulf of Bothnia, Nos. 50 (or 51 and 223), instead of No. 52. If required to be mounted on cloth, the price of each chart will be 3/9 extra.

Norway, Lapland, and North Russia.

53. **NORWAY and LAPLAND**, showing the navigation between the North and White Seas. With plans of the vicinity of Hammerfest and Tromsø, the port of Drontheim, and the bay of Arkhangel. On two large sheets. Accompanied with a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6
54. **BRITISH ISLANDS to the GULF of OBI**. The same chart as No. 53, but with two additional sheets to show the navigation eastward of the White Sea. With a large plan of Petshora Bay. (In preparation.)
55. **BRITISH ISLANDS to the WHITE SEA (Chart No. 1)**. On two large sheets. Limits: latitude $56^{\circ} 0'$ to $63^{\circ} 5' N.$, longitude $9^{\circ} 40' W.$ to $9^{\circ} 40' E.$... 8/-
56. **BRITISH ISLANDS to the WHITE SEA (Chart No. 2)**. On two large sheets. Limits: latitude $62^{\circ} 10'$ to $68^{\circ} 0' N.$, longitude $2^{\circ} 15' W.$ to $15^{\circ} 0' E.$... 8/-
57. **BRITISH ISLANDS to the WHITE SEA (Chart No. 3)**. On two large sheets. Limits: latitude $67^{\circ} 10'$ to $72^{\circ} 0' N.$, longitude $9^{\circ} 35'$ to $28^{\circ} 0' E.$... 8/-
58. **BRITISH ISLANDS to the WHITE SEA (Chart No. 4)**. On two large sheets. Limits: latitude $68^{\circ} 0'$ to $72^{\circ} 35' N.$, longitude $25^{\circ} 35'$ to $44^{\circ} 0' E.$... 8/-
59. **BRITISH ISLANDS to the WHITE SEA (Chart No. 5)**. Showing the WHITE SEA. On two large sheets. With plans of Arkhangel, Sosnovets, Veshnyak, Nokuev, Sem Islands, Iukanskie and Onega Harbours, the Gulf of Onega, &c. Illustrated with numerous views of the coast, and improved by many explanatory notes. Limits: latitude $63^{\circ} 46'$ to $69^{\circ} 0' N.$, longitude $31^{\circ} 30'$ to $47^{\circ} 30' E.$ Accompanied with a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6

- 12. BRITISH ISLANDS to the WHITE SEA and PETSHORA BAY**
 (Chart No. 6). Showing the navigation eastward of the White Sea to Petshora Bay. With a large plan of the Bay. On two large sheets ... 8/-
 On cloth for Captains' use ... 10/6

Shipmasters going to Arkhangel should take charts Nos. 53, 55, 56, 57, 58, 59, as those publications exhibit the whole voyage to the White Sea. With the exception of No. 53 (a general chart for the whole navigation) the charts are all on the same scale and each contains many plans of harbours. The series is accompanied with a small Index chart (for which no charge is made), and it is requested that purchasers ask for it, if it be not supplied.

Sea west and north of the British Islands, including Iceland.

- 33. SEA NORTH-WEST of the BRITISH ISLANDS**, with plans of the Caledonian Canal and Rockall Bank. This chart is specially adapted to the use of Shipmasters frequenting Rockall Bank and the Færoe Islands in pursuit of the Fishery, as it shows Rockall Bank on a large scale. On two large sheets. Limits: latitude $53^{\circ} 50'$ to $63^{\circ} 35' N.$, longitude $0^{\circ} 30'$ to $15^{\circ} 40' W.$... 8/-
 On cloth for Captains' use ... 10/6
- 34. WEST COAST of the BRITISH ISLANDS.** The same chart as No. 33 (Sea north-west of the British Islands), but with an additional sheet. This chart shows the whole of the Irish Channel, the coast round Ireland, the Bristol Channel, and the English Channel west of the Isle of Wight; it also exhibits the navigation west of the British Islands between the English Channel and the Færoe Islands. Limits: latitude $48^{\circ} 20'$ to $63^{\circ} 35' N.$, longitude $0^{\circ} 30'$ to $15^{\circ} 40' W.$ On three sheets ... 10/-
 On cloth for Captains' use ... 13/9
- 35. FÆROE ISLANDS to the BAY of BISCAY.** On four large sheets. 12/-
 On cloth for Captains' use ... 17/-
- 251. NORWAY and LAPLAND to ICELAND.** This chart shows the navigation from the North and White Seas to Iceland, also from the north part of Scotland to Iceland. It contains plans of Jan Mayen Island, the Færoe Islands, Thorshaven (Færoe Islands), Hammerfest, Tromsøe, Drontheim and Arkhangel. On three large sheets ... 12/-
- 252. NORTH SEA to ICELAND.** A large chart on three sheets, showing the navigation to Iceland from the North Sea, the western coast of Norway, and the northern part of Scotland. With a plan of Bergen and the south channel leading to it; also one of Reikiavik bay and harbour. Limits: latitude $58^{\circ} 35'$ to $67^{\circ} 10' N.$, longitude $12^{\circ} 0' E.$ to $25^{\circ} 40' W.$... 12/-
 On cloth for Captains' use ... 15/9
- 253. BRITISH ISLANDS to ICELAND.** Two sheets of chart No. 252 8/-
 On cloth for Captains' use ... 10/6
- 254. ICELAND.** A large chart on two sheets. This publication also shows all that is known of the interior of the island; consequently it is as useful to the traveller as the yachtman ... 8/-
 On cloth for Captains' use ... 10/6

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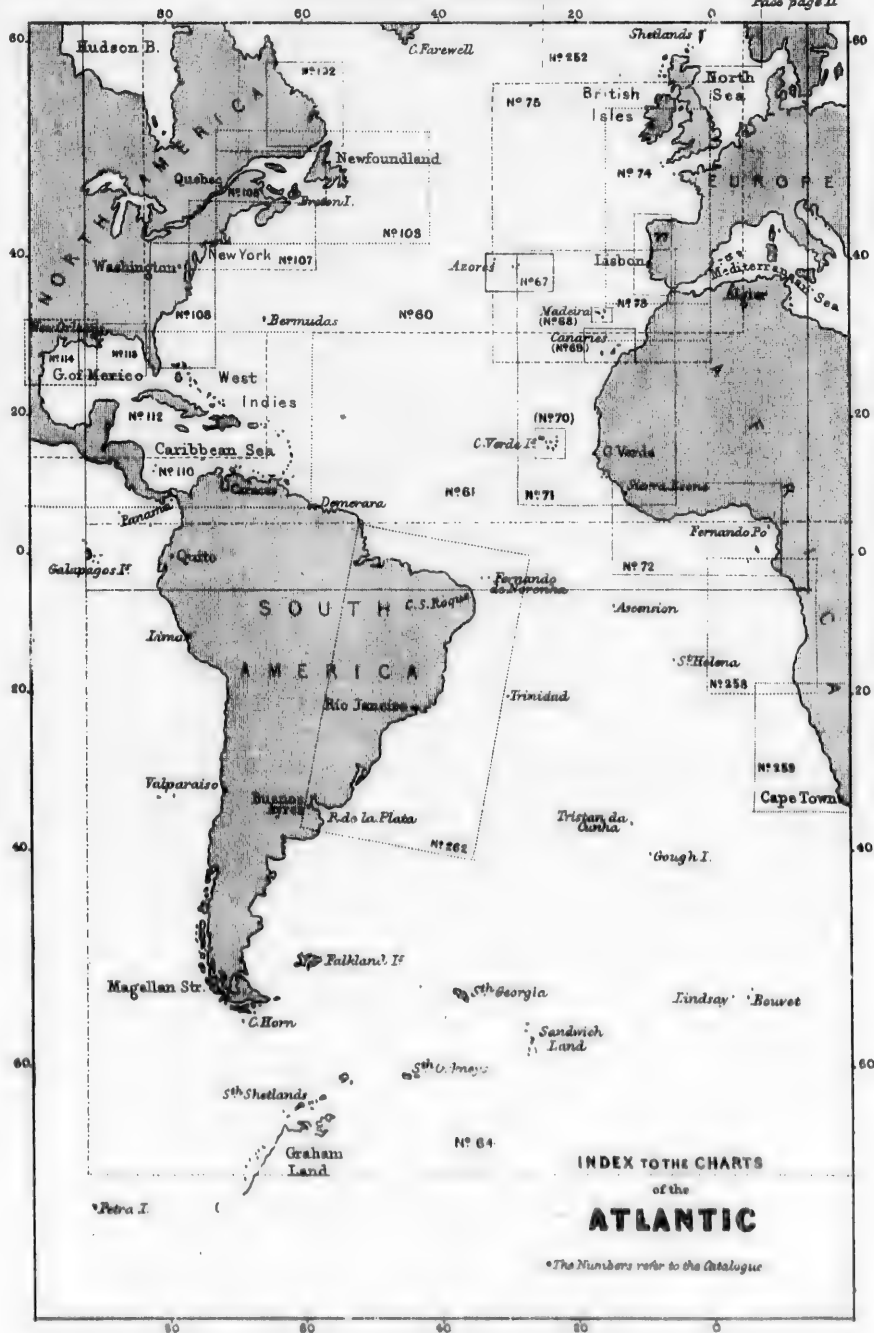
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Atlantic Ocean.

263. **ATLANTIC.** A chart showing the navigation from Europe and North America to Cape Horn and the Cape of Good Hope. On two large sheets ... 8/-
This Chart may also be had in two parts, as follows: No. 264, 265.
264. **NORTH ATLANTIC (Europe and North America to the Equator).**
On one large sheet ... 4/-
265. **SOUTH ATLANTIC (the Equator to Cape Horn and the Cape of Good Hope).** On one large sheet ... 4/-
60. **ATLANTIC (Northern Part).** On three large sheets. Limits: latitude 31° N. to 61° N., longitude 5° E. to $83^{\circ} 20'$ W. A very useful chart for the North American trade, as it shows the northern part of the Atlantic on an unusually large scale. With plans of the coast in the vicinity of Cape Race (Newfoundland), Sable Island, and St. George's Bank (United States). With a Book of Directions ... 12/-
61. **NORTH ATLANTIC,** from Greenland to the Equator, on a very large scale; with plans of the harbour of Funchal, Horta and Pim Bays, and Fayal Channel, and Bermuda Islands. Illustrated with some views. This chart contains much valuable information on the winds and currents. ... 8/-
On cloth for Captains' use ... 10/6
On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. ... 21/-
62. **Short Notes on the North Atlantic.** A small pamphlet containing Sailing Directions and remarks on making passages across the North Atlantic, price 1/6, to accompany this chart.
63. **NORTH ATLANTIC (Chart showing the Currents).** The same chart as No. 61, but with the currents distinctly shown in colour, and with an additional sheet of plans, consisting of Track, Magnetic, Tidal and Wind Charts. Accompanied by the pamphlet No. 62 "Short Notes on the North Atlantic" ... 12/-
On cloth for Captains' use ... 15/9
64. **SOUTH ATLANTIC,** on two large sheets, from the Equator to 65° south latitude, on a very large scale; with plans of the islands of St. Helena, Ascension, Trinidad, Martin Vas, Fernando Noronha, Rocas Reef, &c. Illustrated with some views. Much valuable information on the winds, currents, and temperature of the water is embodied in this chart ... 8/-
On cloth for Captains' use ... 10/6
On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. ... 21/-
65. **Short Notes on the South Atlantic.** A small pamphlet containing Sailing Directions and remarks on making passages across the South Atlantic, price 1/- to accompany this chart.
66. **SOUTH ATLANTIC (Chart showing the Currents).** The same chart as No. 64, but with the currents distinctly shown in colour, and with an additional sheet of plans, consisting of Track, Magnetic, Tidal, and Wind Charts. Accompanied by the pamphlet No. 65 "Short Notes on the South Atlantic" ... 12/-
On cloth for Captains' use ... 15/9

NOTE.—This chart, with the chart of the North Atlantic, No. 63, shows the whole navigation from Europe and the United States to the Cape of Good Hope and Cape Horn, and will be found very serviceable, as the directions of all the known currents are delineated.

Scattered Islands in the Atlantic.

67. **AZORES or WESTERN ISLANDS.** One sheet, on a very large scale. With numerous plans of harbours. Drawn principally from recent Admiralty surveys. A beautifully engraved chart ... 4/-
On cloth for Captains' use ... 5/3

68. **MADEIRA, PORTO SANTO, and the DEZERTAS**, on one sheet, with a plan of the harbour of Funchal, and illustrated with some views. Drawn from recent Admiralty surveys ... 4/-
On cloth for Captains' use ... 5/3
69. **CANARY ISLANDS**. With plans of harbours. Illustrated with some views. ... 4/-
On cloth for Captains' use ... 5/3
70. **CAPE VERDE ISLANDS**, on a very large scale. With plans of Porto Grande, Praya, Mordeira, English Road; the most important harbours in the group. Numerous views of headlands, and remarks upon making the harbours. Drawn chiefly from Admiralty surveys ... 4/-
On cloth for Captains' use ... 5/3

Atlantic Coast of France and Spain; including Portugal.

- 73.* **BRITISH ISLANDS TO THE COAST OF AFRICA**, showing the navigation from Liverpool and Ireland to Mogador. With plans of all the principal harbours. On four large sheets. With a Book of Sailing Directions ... 12/-
On cloth for Captains' use ... 17/-
- 74.* **FRANCE, SPAIN, and PORTUGAL (the West Coasts of)**, extending from the entrance of the Irish Channel to Gibraltar. With plans of all the principal harbours. Accompanied with a Book of Directions ... 10/-
On cloth for Captains' use ... 13/9
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

* Either of these charts with No. 33, will show the navigation from the Faeroe Islands to the Mediterranean.

- 75.† **BRITISH ISLANDS to the MEDITERRANEAN, CANARIES, MADEIRAS, and AZORES**. On two very large sheets, and with plans of harbours. Limits: latitude 26° N. to latitude 56° N.; longitude 0° 40' W. to 31° 30' W. ... 8/-
On cloth for Captains' use ... 10/6

† This is a very useful chart, specially intended for the fruit trade and shipmasters bound to the Azores or Mediterranean.

- 76.‡ **BAY of BISCAY**. Drawn from recent surveys made by order of the French Government. With plans of the principal harbours. On two large sheets. Accompanied with a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6

268. **WEST COAST OF FRANCE (Brest to Bordeaux)**. A large Chart on three sheets, with plans of Quiberon bay, the mouth of the Gironde, and the port of Sables d'Olonne. Compiled from recent French surveys. With a Book of Directions ... 12/-

269. **WEST COAST OF FRANCE (Approaches to Brest)**. A large sheet showing Ouessant island and channel, the Chaussée de Sein, Douarnenez bay, and Brest roadstead. With plans on a very large scale of the Chenal du Four, the Goulet de Brest, and Brest harbour and its dock accommodation. Compiled from recent French surveys ... 5/-

- 77.‡ **COAST of SPAIN and PORTUGAL (Cape Ortegal to the Strait of Gibraltar)**. With plans on a large scale of the harbours of Cadiz and Setuval, the rivers Guadalquivir, Odiel, Tinto, Tagus and Douro, Burling islands, and the bays of Arosa, Pontevedra, Vigo, Corcubion and Maros. Drawn from Spanish and Portuguese surveys. On three large sheets. Accompanied with a Book of Sailing Directions ... 12/-
On cloth for Captains' use ... 15/9

‡ Charts Nos. 76 and 77 show the navigation from the English Channel to the Mediterranean. They are on the same scale, and follow the one from the other.

78. **COAST of PORTUGAL and SPAIN, from Cape San Vicente to Gibraltar**. On a very large scale. With plans of the principal harbours; Cadiz, the Rivers Odiel, Guadalquivir, &c. This chart is from recent surveys, and published specially for the trade to Pomeroon and Seville ... 5/-
On cloth for Captains' use ... 6/3

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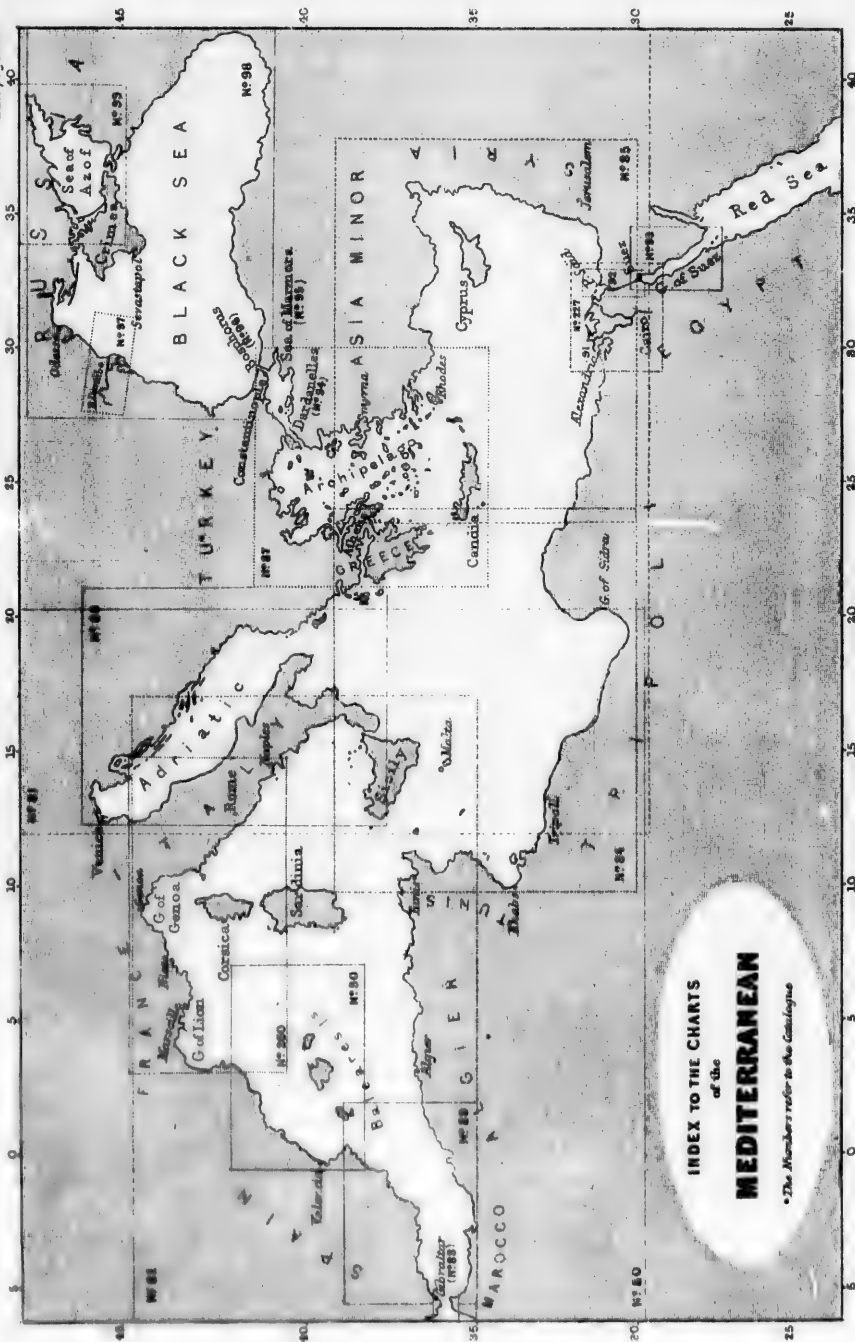
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INDEX TO THE CHARTS
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The Numbers refer to the Catalogue

Mediterranean.

79. **MEDITERRANEAN.** On four large sheets, and containing about thirty plans of harbours, &c., among which are the following:—Malaga, Alicante, Barcelona, Villefranche, Strait of Gibraltar, Cartagena, Genoa, Hyeres Road, Leghorn, Toulon, Cagliari, Algiers, Strait of Bonifacio, Gulf of Naples, Palermo, Strait of Messina, Valetta, Smyrna, River Danube, Alexandria, Cephalonia, Trieste, Patras, &c. Illustrated with numerous views of the coast, and descriptive notes. Drawn from recent surveys made by order of the British, French, Austrian, and Russian Governments. A beautifully engraved and elegant chart ... 12/-
On cloth for Captains' use ... 17/-
On cloth and rollers for Counting-house, coloured and varnished; size 8 ft. 4 in. by 3 ft. 4 in. ... 42/-
This chart may also be had in two Parts, as follows:—
80. **(Part I.)—Gibraltar to the Adriatic,** on two large sheets. This chart shows the navigation between the coast of Spain and the ports in the Adriatic, and contains many plans of harbours ... 7/-
On cloth for Captains' use ... 9/6
81. **(Part II.)—Italy to Alexandria,** on two sheets. This chart comprises the navigation between the Adriatic, Black Sea, and the Levant, and contains numerous plans of harbours ... 7/-
On cloth for Captains' use ... 9/6
- 82.* **MEDITERRANEAN (Western Portion of),** on three large sheets, showing the navigation between Gibraltar and Malta on the most extensive scale yet published. With numerous plans of harbours. Accompanied with a Book of Directions. (A new chart.) ... 12/-
On cloth for Captains' use ... 15/9
- 83.* **MEDITERRANEAN (Eastern Portion of),** on four large sheets, showing the navigation between Sicily and Malta and the coast of Egypt and Syria, on a very large scale. With numerous plans of harbours. Accompanied with a Book of Directions. (A new chart.) ... 12/-
On cloth for Captains' use ... 19/-
- * These two charts (Nos. 82 and 83) show the whole navigation from Gibraltar to Alexandria and the coast of Syria, on a very large scale. The chart No. 83 being very large, may be had in two parts, as in Nos. 84 and 85.
84. **MEDITERRANEAN (Middle Portion of),** on two large sheets, showing the navigation between Sicily and Malta and the Grecian Archipelago. Accompanied with a Book of Directions ... 8/-
85. **MEDITERRANEAN (Levant Portion).** On two large sheets, showing the navigation between the Grecian Archipelago and the coast of Egypt and Syria. With plans of the most important harbours. Compiled from recent surveys. Accompanied with a Book of Directions... 8/-
230. **GULF OF LYONS.** A chart on two large sheets, showing the South Coast of France and the navigation thence to the Strait of Bonifacio. With plans of the harbours of Marseille, Cette, Ciotat, Bandol, St. Nazaire bay, Nice, Villa Franca, Savona, Vado, Portofino, Livorno (Leghorn), Toulon, and Hyeres bay. Limits: latitudes $40^{\circ} 25'$ and $45^{\circ} 0' N.$, longitudes, $2^{\circ} 50'$ and $10^{\circ} 50' E.$ With a Book of Directions. ... 8/-
260. **SOUTH COAST OF FRANCE, and WEST COAST OF ITALY,** as far south as Naples. The same chart as No. 230, and consequently containing all the plans of harbours in that chart, but with an additional sheet to show the navigation from Marseille, through Bonifacio strait, to Naples. The extra plans are Bonifacio strait, Genoa, Piombino channel, Spezia gulf, Naples, Gaeta, Civita Vecchia, Procida and Ischia channels. Limits: latitudes $40^{\circ} 25'$ and $45^{\circ} 0' N.$, longitudes $2^{\circ} 50'$ and $14^{\circ} 50' E.$ With a Book of Directions ... 10/-

86. **ADRIATIC**, on two large sheets, with numerous plans of harbours and views of the coast. Accompanied with a Book of Sailing Directions ... 8/-
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87. **GRECIAN ARCHIPELAGO**. On two large sheets. With plans of Cervi, Skiatho, and Doro channels, the harbours of Syra, Kalamitza, and Sigri; Salamis and Saloniki bays, the gulf of Smyrna and Khios strait, &c. Drawn chiefly from recent British surveys. Accompanied with a Book of Sailing Directions 10/-
88. **GIBRALTAR STRAIT**. A sheet showing the Strait on a very large scale 2/-
89. **COAST of SPAIN (Gibraltar to Cape San Antonio)**, with plans of Cartagena, Malaga, Torre Vieja, Alicante, Almazarron, Almeria, Porman, Aguilhas, Portus, Carbonera, Mount Cope, Grosa island, Benidorme, Herradura bay, Ceuta bay, Alboran island, &c. ... 5/-
On cloth for Captains' use ... 6/3
90. **COAST of SPAIN (Cape San Antonio to Cape San Sebastian, including the Balearic Islands)**, with plans of Barcelona, port Mahon, Valencia, Mattaro, Palma, Tarragona, Alfaques, Salou, Denia, Iviza, Cabrera, Palamos, Fangal, Soller, cape Cullera, Columbretes islands, and the channel between Iviza and Formentera ... 5/-
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91. **ALEXANDRIA (the port of Alexandria and coast in its Vicinity)**. A chart showing the coast of Egypt in the vicinity of Alexandria, on a large scale, with plans of Alexandria harbour and New Port. Published specially for the trade to Alexandria ... 5/-
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227. **COAST OF EGYPT and APPROACHES TO PORT SAID**. A large chart on two sheets showing the Delta of the Nile, and the coast of Egypt eastward from Alexandria to port Said. Also, the Suez Canal, and the port of Suez. ... 8/-
On cloth for Captains' use ... 10/6
92. **SUEZ CANAL and PORT SAID**. A large chart on one sheet. With a Book of Directions ... 3/6
93. **SUEZ CANAL and GULF OF SUEZ**. A chart showing the navigation between port Said and the Upper or Northern (the most dangerous part) portion of the Red Sea. If this chart be taken in connexion with charts Nos. 204, 205, see page 23, the navigation from the Mediterranean to the Indian Ocean will be shown on a large scale. With a Book of Directions ... 7/-
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94. **DARDANELLES**, on one sheet. With plans of the Tenedos channel, Narrows of the Dardanelles and Lamsaki bay ... 5/-
On cloth for Captains' use ... 6/3
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On cloth for Captains' use ... 6/3
96. **BOSPHORUS**. On a very large scale. With a plan of the Golden Horn and Oumour bay ... 5/-
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97. **RIVER DANUBE (Sulina Harbour to Galatz)**. On a very large scale. With a plan of Sulina harbour ... 5/-
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98. **BLACK SEA and SEA of AZOF**, on three sheets. With plans of the Bosphorus and strait of Kertch, Sulina harbour, Kustenjah, Odessa, Balaklava, Burghaz, Varna, Soujak, Rizeh, Batoum, Trebizond, St. Douka, Ghelenjik, Gherzeh, Ounieh, Anapa, Samsoun, Kaffa, Amastra, and Sinoub. Accompanied with a Book of Directions. A beautifully engraved and elegant chart. 12/-
99. **SEA OF AZOF**. On two sheets. With plan of Kertch Strait ... 8/-
On cloth for Captains' use ... 10/6

Shipmasters bound to the Black Sea or Sea of Azof should provide themselves with charts Nos. 82, 83, 87, 94, 95, 96, 97, 98, 99, as they show the navigation on a very large scale.

Newfoundland, Labrador, Gulf and River St. Lawrence.

100. NEWFOUNDLAND. On two large sheets. Drawn from recent English and French surveys. Accompanied with a Book of Directions ... 10/-

218.*BANKS of NEWFOUNDLAND. This chart shows the whole of the Banks from the Flemish Cap to the entrance of the Gulf of St. Lawrence. With plans of the principal harbours. On three large sheets. With a Book of Directions 12/-
On cloth for Captains' use ... 15/9

* See also Nos. 107, 108, 207, which are on the same scale, one chart following the other.

101. SOUTH COAST of NEWFOUNDLAND. On three large sheets. Compiled principally from recent surveys. This chart contains many plans of harbours, and shows the Banks in an accurate manner, on a very large scale, and will be found extremely useful to shipmasters engaged in the Quebec and Montreal trade. With a Book of Directions ... 12/-
On cloth for Captains' use ... 15/9

102. COAST of LABRADOR (Strait of Belle Isle to Port Manvers). On two large sheets. With plans of all the principal harbours. Limits: latitude $51^{\circ} 30'$ to $57^{\circ} 50'$ N., longitude 54° to $62^{\circ} 30'$ W. ... 8/-
On cloth for Captains' use ... 10/6

Charts Nos. 100 and 102 are on the same scale, and are intended to accompany each other.

103. STRAIT of BELLE ISLE to CAPE COD (Gulf and River St. Lawrence, Newfoundland, &c.). On three large sheets. This chart shows the Coast of North America between Belle Isle and Cape Cod, and includes, therefore, the island of Newfoundland, the gulf and river St. Lawrence, and coast of Nova Scotia. In it are plans of Halifax, Conception bay, strait of Belle Isle, St. Pierre, Harbour Grace, Cape Race, Cape Ray, &c. &c. Accompanied with a Book of Directions ... 12/-
On cloth for Captains' use ... 15/9
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

255. BELLE ISLAND TO CAPE COD AND THE BANKS of NEWFOUNDLAND. A large chart on three sheets, especially useful to Fishermen, as it shows the Flemish Cap, the most eastern known bank. With plans of harbours. Accompanied with a Book of Directions ... 12/-

104. GULF of St. LAWRENCE, on two sheets, on a large scale, with plans of numerous harbours. Drawn chiefly from the recent surveys of Captain Bayfield, R.N. ... 8/-
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105. GULF and RIVER St. LAWRENCE. A large chart on three sheets, showing the navigation from the west coast of Newfoundland to Quebec. With many plans of harbours, and accompanied with a Book of Directions ... 12/-
On cloth for Captains' use ... 15/9

The charts (Nos. 60, 101, and 105) show the navigation between Europe, the south coast of Newfoundland, and Quebec, on the largest scale yet published. Each chart is on three sheets.

East Coast of North America.

106. NOVA SCOTIA, NEW BRUNSWICK, and COAST of the UNITED STATES to CAPE COD. A large chart on three sheets. With plans of the harbours of Halifax, Fourchu, Yarmouth, Annapolis, Salem, Portland, Portsmouth, St. John, and of numerous anchorages on various parts of the coast. Illustrated with views of the coast ... 10/-
On cloth for Captains' use ... 14/3

256. **BAY OF FUNDY.** A large chart on two sheets. With plans of St. John harbour, river Petitcodiac, Grand Passage, Petit Passage, Digby Gut, Flag Cove, South-west Harbour and Somes Sound, Etang and Winter Harbours. Limits : latitude $43^{\circ} 10'$ to $46^{\circ} 8' N.$, longitude $63^{\circ} 15'$ to $68^{\circ} 35' W$... 8/-
On cloth for Captains' use ... 10/6
107. **CAPE CANSO to NEW YORK and DELAWARE BAY.** A large chart on three sheets. With plans of the Coast in the vicinity of New York, Boston bay, and Portland harbour. Accompanied with a Book of Directions ... 12/-
On cloth for Captains' use ... 15/9
On cloth and rollers for Counting-house, coloured and varnished ; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
108. **NEW YORK and DELAWARE BAY to the STRAIT of FLORIDA.** On three large sheets. With plans of the most important harbours. Accompanied with a Book of Sailing Directions ... 12/0
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207. **NEW YORK TO KEY WEST, HAVANA, MATANZAS, NASSAU, &c.** On four large sheets, being the same chart as No. 108, but with an additional sheet to show the navigation through Florida strait. With a Book of Sailing Directions ... 14/-
On cloth for Captains' use ... 19/-

NOTE.—The Charts (Nos. 218, 107, 108, or 207) are on the same scale, and one follows the other. They show the Navigation across the Banks of Newfoundland to the ports on the eastern coast of the United States. Vessels from Europe should be provided with chart No. 60, in addition to these publications.

28. **COTTON PORTS OF CAROLINA and GEORGIA.** On three large sheets, showing the coast of the United States westward of cape Fear as far as St. Augustine. Compiled from recent surveys made by the United States Coast Surveyors. With a Book of Directions ... 12/0
On cloth for Captains' use ... 15/9

NOTE.—This Chart shows the approaches to the principal Cotton Ports of the United States on a very large scale. It contains plans of St. Helena sound, Charleston, Bull bay, entrance to Savannah river, Doboy sound, &c.

West Indies, &c.

109. **BAHAMA ISLANDS and BANKS.** On 2½ large sheets. Showing the strait of Florida and adjacent coasts, with plans, on a large scale, of Key West, east part of Florida reef, Havana, Matanzas, New Providence, &c. Drawn from recent surveys. Accompanied with a Book of Directions ... 10/-
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110. **Strait of Florida and Gulf of Mexico, &c.** Showing all the coast and islands westward of longitude $78^{\circ} 30' W.$... 8/-
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On cloth for Captains' use ... 10/6
111. **GULF of MEXICO, and Islands of Cuba, Haiti, and Jamaica, the Caribbees, &c.** On four large sheets. Showing the Windward Passages on a large scale. Price 14/- ; or with a Book of Directions ... 18/-
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112. **GULF of MEXICO, and Islands of Cuba, Haiti, and Jamaica,** being three sheets of Chart No. 111. With a Book of Directions ... 14/-

113. **GULF of MEXICO. Chart No. I. (Tampa Bay to New Orleans).** On two large sheets, and containing plans of the harbours of Apalachicola, St. Andrew, Pensacola, Entrance to Mobile bay, and the Passes of the Mississippi. 8/-
114. **GULF of MEXICO. Chart No. II. (New Orleans to Tampico).** On three large sheets, and containing plans of the harbours of Galveston, Atchafalaya bay, Sabine Pass, Matagorda bay, Entrance to the Rio Grande, and Tampico. 10/-
250. **GULF of MEXICO. Chart No. III. (Tampico to Cape Catoche).** With plans of all the harbours contained within its limits—Vera Cruz, Miniatitlan, entrance to the Laguna de Terminos, &c. &c. On three large sheets 10/-
115. **BAY OF HONDURAS (Cape Catoche to Cape Gracias).** On two large sheets. With plans of the Approach to Belize, Turneffe cays, Chinchorro Bank anchorages, St. Thomas Bight, Hospital Bight, Port Cortez, Omoa, Coxen Hole (Roatan), East Harbour (Utilla), and Port Royal (Roatan). With a Book of Directions ... 8/-
- These four charts, Nos. 113, 114, 250, and 115, are on the same scale, and intended to accompany each other.
116. **CARIBBEAN SEA. Showing the coast of the main land included between the Caribbee Islands and Cape Gracias.** On three large sheets. With plans of the harbours of Aspinwall, Barcelona, Cumana, Porto Cabello, Santa Anna, Sabanillo, La Guayra, Chagres, &c., &c. Drawn from recent British and Spanish surveys. Accompanied with a Book of Directions... 12/-
- N.B.—See also charts Nos. 214, 215, 210, each of which is in two large sheets. These three charts comprise the same limits as this chart.
- 214.* **CARIBBEAN SEA—Western Part (Cape Gracias to the Gulf of Darien and Fuerte Island).** On two large sheets, and containing plans of all the principal harbours. This chart shows the navigation between Cape Gracias, Jamaica, &c., and Panama. Limits: lat. 8° N. to lat. 18° 20' N., long. 75° 54' W. to long. 83° 55' W. ... 8/-
- 215.* **NORTH COAST of SOUTH AMERICA (Gulf of Darien to Roques Islands).** On two large sheets, and containing plans of all the principal harbours. Limits: lat. 8° N. to lat. 15° 46' N., long. 66° 52' W. to long. 77° 20' W. 8/-
- 210.* **CARIBBEE ISLANDS.** A large chart in two sheets. Compiled from recent surveys, and containing plans of the Dragons' Mouths, Serpent's Mouth, Port Spain (Trinidad); Bridgetown, South Point, Kilridge Point (Barbados); Scarborough (Tobago); Basseterre (St. Christopher); Orangetown (St. Eustatius); Port Royal bay (Martinique); Falmouth and St. John's (Antigua). Accompanied with a Book of Directions ... 10/-
- * See Note on page 18, below Chart No. 123.
117. **CARIBBEE ISLANDS.** Being one sheet of the Chart No. 111. An elegantly engraved chart ... 5/-
118. **CUBA.** On a very large scale, and with plans of all the principal harbours. Drawn from Spanish surveys. On two large sheets ... 8/-
- Charts Nos. 109 and 118 are on the same scale.
119. **HAITI or SAN DOMINGO.** Compiled from recent surveys ... 5/-
270. **PORTS and HARBOURS in HAITI. Sheet I.** Miragoane bay; Juan Rabel anchorage; Samana bay; Port-au-Prince; Fond La Grange; Port Paix; Salt River and Chouchou bays; Manzanillo bay; Acul bay; Petit Goave bay; Gonaives bay; St. Mark bay; Fort Dauphin bay; St. Nicolas (La Mole) bay; Tiburon, Jeremie, and San Lorenzo bays; Port Plata; San Domingo; Tierra-Baja roadstead; Moustique bay; and Port à l'Ecu ... 5/-
271. **PORTS and HARBOURS in HAITI. Sheet II.** Approaches to Cayes; anchorage at Cayes; Cayes à l'eau anchorage; Cape Haiti harbour; Monte Christi; Cayemites bay; Port-au-Prince bay; Jaquemel harbour; Caldera bay; Trois Bay; Dame Maria bay; and Nayassa island ... 5/-

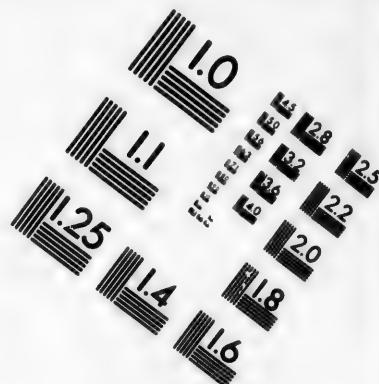
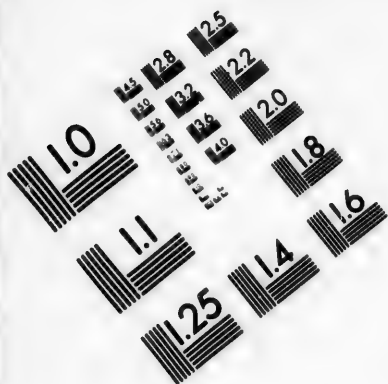
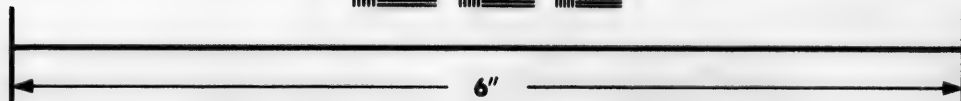
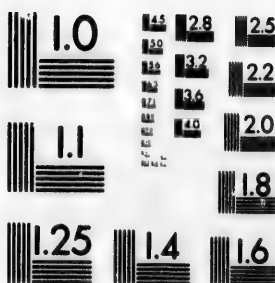


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120. **PUERTO RICO and VIRGIN ISLANDS.** On two large sheets. With plans of St. Thomas' harbour, Road harbour, Gorda sound, South-east end of Culebra, Christiansted, Mona island, Sombrero island, Guanica, Mayaguez, Ponce, and San Juan harbours. With a Book of Directions ... 8/-
121. **GUADELOUPE.** A chart of the island from French surveys. On a large scale. With plans of all the harbours ... 6/-
216. **ST. LUCIA.** A chart of the island from French surveys, on a large scale 6/-
219. **VIRGIN ISLANDS.** On one large sheet. From recent surveys. With a plan of the harbour of St. Thomas ... 5/-

East Coast of South America.

- 122* **COAST of GUIANA, &c.** (Trinidad to Cape Cachipour.) Showing the various harbours and rivers of Demerara, Berbice, Cayenne, &c. Drawn from recent surveys. On two large sheets... 8/-
On cloth for Captains' use ... 10/6

- 123* **APPROACHES to the RIVERS AMAZONA, PARA, &c.** (Cape Cachipour to Maranhão). With plans of the River Para and Maranhão. Drawn from recent surveys ... 8/-
On cloth for Captains' use ... 10/6

* The five charts Nos. 124, 216, 210 (see page 17) 125, 123, are on the same scale, and show the navigation along the north coast of Central America, and South America from Cape Gracias and Jamaica, to Puerto Rico and Maranhão.

262. **COAST OF BRAZIL AND THE ARGENTINE CONFEDERACY.** A large chart on three sheets showing the navigation from the Amazona river to Monte Video and Buenos Ayres in the Rio de la Plata. With plans of Tutuía anchorage; Maranhão; Ceara; the Rocas reef; shoals off cape St. Roque; the river Pará; Pernambuco; Bahia; Santos; Ilheus anchorage; Cabral and Santa Cruz bays; Espírito Santo bay; coast in the vicinity of cape Frio; cape Frio harbour; Santa Catharina; banks off cape St. Thomé; Abrolhos reefs; Rio Grande do Sul; Maldonado and Lobos island; Rio de Janeiro; Monte Video; Paloma harbour and roadstead; and the anchorages at Castillo and Polonio. Compiled from recent surveys. With a Book of Directions ... 12/-
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- 124.† **COAST OF BRAZIL** (Maranhão to Cape Frio and Rio Janeiro). On three large sheets. With plans of the most important harbours on the coast. Compiled chiefly from recent surveys made by M. Mouchet of the French Navy, and Don A. Vital de Oliveira of the Brazilian Navy. Illustrated with many views of the coast. Accompanied with a Book of Directions ... 10/-
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- 125.† **COAST of BRAZIL** (Cape Frio and Rio Janeiro to the River Plate). On two large sheets. In this chart are given plans of the most important harbours, such as Rio Janeiro, Marambay, Santos, Cananea, Rio Grande, Monte Video, cape Sta. Maria, &c., and there are explanatory notes which add considerably to its value. Compiled chiefly from recent French and British surveys. Accompanied with a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6

† These two charts (Nos. 124 and 125) comprise the whole of the coast of Brazil, and are laid down upon the plain scale, not the diagonal.

126. **RIVER PLATE.** A large scale chart, on two sheets, showing the navigation to Monte Video and Buenos Ayres. With plans of Monte Video, Buenos Ayres, Maldonado, &c. Compiled from recent British, French, Spanish, and American surveys. With a Book of Directions ... 7/-
On cloth for Captains' use ... 9/6

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127. **RIVER PLATE and RIVERS PARANA and URUGUAY.** The same Chart as No. 126, but with a supplementary sheet showing the course of the Rivers Parana and Uruguay, from Buenos Ayres to Rosario and Paysandu. With a Book of Directions ... 10/0
On cloth for Captains' use ... 13/9
For the convenience of purchasers the Supplementary Sheet (Rivers Parana and Uruguay) is also supplied separately, price 4s.

South and West Coasts of South America.

128. **SOUTH AMERICA (COAST of)** from Rio de la Plata round Cape Horn to Valparaiso, on three sheets. With plans, on a large scale, of Valdivia Bay, Ancud Bay, Stanley Harbour (Falklands), the Strait of Le Maire, and of Cape Horn, and the islands in its vicinity. Drawn from the surveys of Captains Fitzroy and King, of the Royal Navy. A beautifully engraved and accurate chart ... 12/-
On cloth for Captains' use ... 15/9
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
226. **STRAIT OF MAGELLAN, and COAST and ISLANDS OF CAPE HORN.** A Chart, on two large sheets, showing the navigation through Magellan Strait and also round Cape Horn. With plans of Harbours ... 8/-
On cloth for Captains' use ... 10/6
- 129.* **SOUTH AMERICA (Chart No. 1).** *Showing the navigation from Rio de la Plata to Magellan Strait and the Falkland Islands.* On three large sheets. With numerous plans of harbours. Limits: latitudes, 34° S. to 54° S.; longitudes, 54° 40' W. to 69° 30' W. ... 10/-
On cloth for Captains' use ... 13/9
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On cloth for Captains' use ... 13/9
- 131.* **SOUTH AMERICA (Chart No. 3), from Magellan Strait to Valparaiso.** On three large sheets. With plans of the harbours of Valparaiso, Concepcion, Valdivia, Chancal, San Carlos, Barbara, Otway, &c. &c. Limits: latitudes, 53° S. to 32° S.; longitudes, 71° W. to 85° 50' W. ... 10/-
On cloth for Captains' use ... 13/9
- 132.* **SOUTH AMERICA (Chart No. 4), from Valparaiso to Truxillo.** On three large sheets. With plans of the harbours of Callao, Pisco Bay (Chinca Islands), Ilay, Papudo, Horcon, Quintero, Coquimbo, Atico, Huasco, Ylo, Arica, Valparaiso, &c. &c. Limits: latitudes, 34° S. to 8° S.; longitudes, 68° W. to 82° 50' W. ... 10/-
On cloth for Captains' use ... 13/9
- 133.* **SOUTH AMERICA (Chart No. 5).** *Showing the navigation between Truxillo and Panama.* On two sheets. With plans on a large scale of all the principal harbours ... 8/-
On cloth for Captains' use ... 10/6
- * These general Charts (Nos. 129, 130, 131, 132, and 133) are all new, and show the navigation from the River Plate round Cape Horn to Panama, on the largest scale yet published. They are very clearly and beautifully engraved, are all on the same scale, and no expense has been spared in their production.
231. **St. Helena Point to Sechura Bay, including the River Guayaquil.** With plans of all the harbours contained within its limits. Limits: latitude 2° 10' S. to 5° 40' S. ... 4/-
232. **Sechura Bay to Paycasmayo Bay.** With plans of Lambayeque Road, port Eten, and the islands Lobos de Tierra, Lobos de Afuera. Limits: latitude 5° 20' S. to 7° 40' S. ... 4/-

233. **Paycasmayo Bay to Port Chimbote.** With plans of the bays of Paycasmayo, Malabrigo, Huanchaco, and Santa, the Guanape islands, &c. Limits: latitude $7^{\circ} 20'$ to $9^{\circ} 30'$ S. ... 4/-
234. **Port Chimbote to Callao.** With plans of the bays of Chimbote, Sumanca, Ancon, Supe, Casma, Huacho, Culebras, Chancay, and Guarmey. Limits: latitude $9^{\circ} 10'$ to $12^{\circ} 30'$ S. ... 4/-
235. **Callao to Port San Nicolas.** With plans of Callao, Chinca islands, Paraca bay, port Chilca, the channel within Gallan island, and Independencia bay. Limits: latitude $11^{\circ} 50'$ to $15^{\circ} 17'$ S. ... 4/-
236. **Port San Nicolas to Cornejo Point.** With plans of ports San Nicolas, San Juan, Atico, Lomas, Quilca, and the anchorage in front of Quilca. Limits: latitude $15^{\circ} 0'$ to $17^{\circ} 0'$ S. ... 4/-
237. **Cornejo Point to Cape Lobos.** With plans of ports Mollendo, Ilay, Arica, and Ylo. Limits: latitude $16^{\circ} 40'$ to $19^{\circ} 0'$ S. ... 4/-
238. **Cape Lobos to Cape Paquica.** With plans of Chipana, Patillos, Mexillon, and Pisagua bays; the anchorages of Pabellon de Pica and Iquique, &c. &c. Limits: latitude $18^{\circ} 30'$ to $22^{\circ} 0'$ S. ... 4/-
239. **Cape Paquica to Port Paposo.** With plans of the anchorages of Algodon, Cobiya, Angamos, Constitucion, Chimba, Antofagasta, and El Cobre. Limits: latitude $21^{\circ} 50'$ to $25^{\circ} 10'$ S. ... 4/-
240. **Port Paposo to Herradura Bay.** With plans of Carissais, Taltal, Paposa, Copiapo, Pajonel cove, Herradura, Chaferral, and Tortoralillo bays, Caldero, Yngles, Flamenco, and Lavata bays. Limits: latitude 25° S. to $28^{\circ} 10'$ S. ... 4/-
241. **Herradura Bay to River Limari.** With plans of Huasco, Coquimbo, and Herradura bays, Tongoy bay, Chaferral island and bay, Peña Blanca, Choros and Apollillado bays. Limits: latitude 28° S. to 31° S. ... 4/-
242. **River Limari to Toro Point.** With plans of Valparaiso bay, Lagunilla bay, port Papudo, Quintero bay, Maytencillo cove, Pichidangu bay, Algarrobo bay, Ligua roadstead, Conchal bay and neighbouring coast, Chigualoco bay, port San Antonio, &c. Limits: latitude $30^{\circ} 50'$ S. to $33^{\circ} 49'$ S. ... 4/-
243. **Toro Point to Collumo Bay.** With plans of Llico and Curanipe roads, Collumo bay, Tamana bay, Topocalma roadstead, and entrance to Maule river. Limits: latitude $33^{\circ} 43'$ S. to latitude $36^{\circ} 35'$ S. ... 4/-
244. **Collumo Bay to River Yenellenchico.** With plans of Concepcion bay, Coronel and Lota bays, Santa Maria island, San Vicente bay, Mocha island, port Yanez, Quidico or Nena port, Queule bay, river Lebu, river Imperial, and river Tolten, &c. Limits: latitude $36^{\circ} 25'$ S. to latitude $39^{\circ} 11'$ S. ... 4/-
245. **River Yenellenchico to Port San Carlos.** With plans of Port San Carlos (Ancud), Valdivia, Queule bay, Tolten river, Lamehuapi cove, Condor cove, Mulcolpu cove, San Pedro bay, Ranu cove, and Milagro cove. Limits: latitude $39^{\circ} 0'$ S. to $41^{\circ} 52'$ S. ... 4/-

* These charts (No. 231 to No. 245) comprise the coast of South America from the river Guayaquil to Port San Carlos. They are all on the same scale (about 11½ inches to a Degree of Longitude), and from the most recent English, Chilian, and French surveys, and each contains plans of the harbours contained within its limits, and Sailing Directions for making the ports.

West Coast of North America.

134. **WEST COAST OF AMERICA.—Panama to San Blas.** On three large sheets. With plans of the harbours of Sihuatanejo, Acapulco, Guatulco, San Carlos, Realjo, Salinas, Culebra, Punta Arenas, Arenitas, San Blas, &c., &c.; and illustrated with some views of the coast. Drawn from the most recent surveys 12/-
On cloth for Captains' use ... 15/9
135. **CALIFORNIA (COAST of).—San Blas to San Francisco Bay,** on two large sheets, with plans of the harbours of Mazatlan, Magdalena Bay, Guaymas, Monterey, San Francisco, &c. Compiled chiefly from the United States Coast survey, the surveys executed by the naval officers employed by the U.S. Hydrographic Office, and the surveys made by English and French naval officers 10/-
On cloth for Captains' use ... 12/6

136. **OREGON and VANCOUVER ISLAND (COAST of).** On two large sheets. With many plans of harbours, including St. Juan de Fuca Strait, Port Victoria, Nootka Sound, Port San Juan, Beecher and Pedder Bays, and Esquimault Harbour ... 10/-
On cloth for Captains' use ... 12/6
137. **North Pacific Pilot (Part 1).** A Sailing Directory for the West Coast of North America, between Panama and Queen Charlotte Islands, including Port Simpson and Sitka Sound. With numerous plans of harbours. New and enlarged Edition (1882). Intended to accompany the Charts Nos. 134, 135, and 136. By James Frederick Imray, F.R.G.S. ... 12/-

West Coast of Africa.

211. **GIBRALTAR STRAIT to MOGADOR, &c.** A large chart on two sheets, showing the navigation from the south coast of Spain to the ports on the north-west coast of Africa. With plans of Mogador, El Araish, Dar-el-Beida (Casa Blanca), Mazaghan, Mehediyah, Rabat, Safi, and Agadir; also of Cape Spartel. Limits: latitudes 30° ' and 37° ' N.; longitudes 5° ' and 11° ' W. ... 8/-
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71. **GIBRALTAR to SIERRA LEONE.** On three large sheets. With plans of Mazaghan, Rabat and Salé, Mogador, Gorée bay, Cazamance river, the anchorage at Isle de Los, the anchorage at the river Senegal, entrance to the river Gambian, Portendik, Agadir or Santa Cruz, Sierra Leone, and the coast of Sierra Leone. Limits: latitudes 6° ' N. and 41° ' N., longitudes 5° ' W. and 26° ' W. ... 12/-
On cloth for Captains' use ... 15/9
272. **GIBRALTAR STRAIT to RIVER OURO, including Madeira and Canary Islands.** With plans of Mogador, El Araish, Dar-el-Beida (Casa Blanca), Mazaghan, Mehediyah, Rabat, Safi, Agadir, Ouro river, &c. &c. On two large sheets. Limits: latitudes 39° ' N. and 23° ' N., longitudes 19° ' W. and 5° ' W. ... 8/-
273. **RIVER OURO to SIERRA LEONE, including Cape Verde Islands.** With plans of Portendick, Gorée, Sierra Leone, &c. &c. On two large sheets. Limits: latitudes 24° ' N. and 6° ' N., longitudes 26° ' W. and 12° ' W. ... 8/-
72. **SIERRA LEONE to CAPE LOPEZ.** On three large sheets. With plans of cape Palmas; the coast in the vicinity of cape Palmas; Tabou river; Monrovia bay; Sierra Leone and shoals of St. Ann, Cape Three Points; Axim bay; Tacorady bay; Elmina bay; Chama bay; Cape Coast Castle; Dix cove; Gallinas; Clarence cove; Junk river; Sinou bay; George bay; Sangwin river; Cestos bay; Edina; and Grand Bassa. Limits: latitudes 10° ' N. and 3° ' S.; longitudes 15° ' W. and 10° ' E. ... 12/-
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258. **CAPE LOPEZ to CAPE FRIO.** A large chart on two sheets. With plans of Anno Bom island, the anchorage at Anno Bom, the Mouth of the Congo, Vesuvius shoal, Black point bay, Turtle cove, Mayumba bay, Malemba bay, Kabenda bay, Loango bay, St. Paul de Loanda harbour, Lobito bay, Equimina bay, Benguela bay, St. Mary bay, Elephant bay, Little Fish bay, port Alexander, Mouches bay, Great Fish bay, and Quicombo bay. Limits: latitudes 0° ' S. and 18° ' S.; longitudes 3° ' E. and 17° ' E. ... 8/-
259. **CAPE FRIO to the CAPE of GOOD HOPE.** On two large sheets. With plans of Walfisch bay, Walfisch bay settlement, Spencer bay, port D'ilheo, Hottentot bay, Angra Pequena, port Nolloth, Hondeklip bay, Roodewall bay, McDougall harbour, Saldanha and St. Helena bays, Dassen island and coast in its vicinity, and Table bay. Limits: latitudes 18° ' and 34° ' S.; longitudes 6° ' E. and 20° ' E. ... 8/-

Charts Nos. 272, 273, 72, 258, 259, are on the same scale, one following the other. These five charts show the whole of the West Coast of Africa from Gibraltar Strait to the Cape of Good Hope on a large scale.

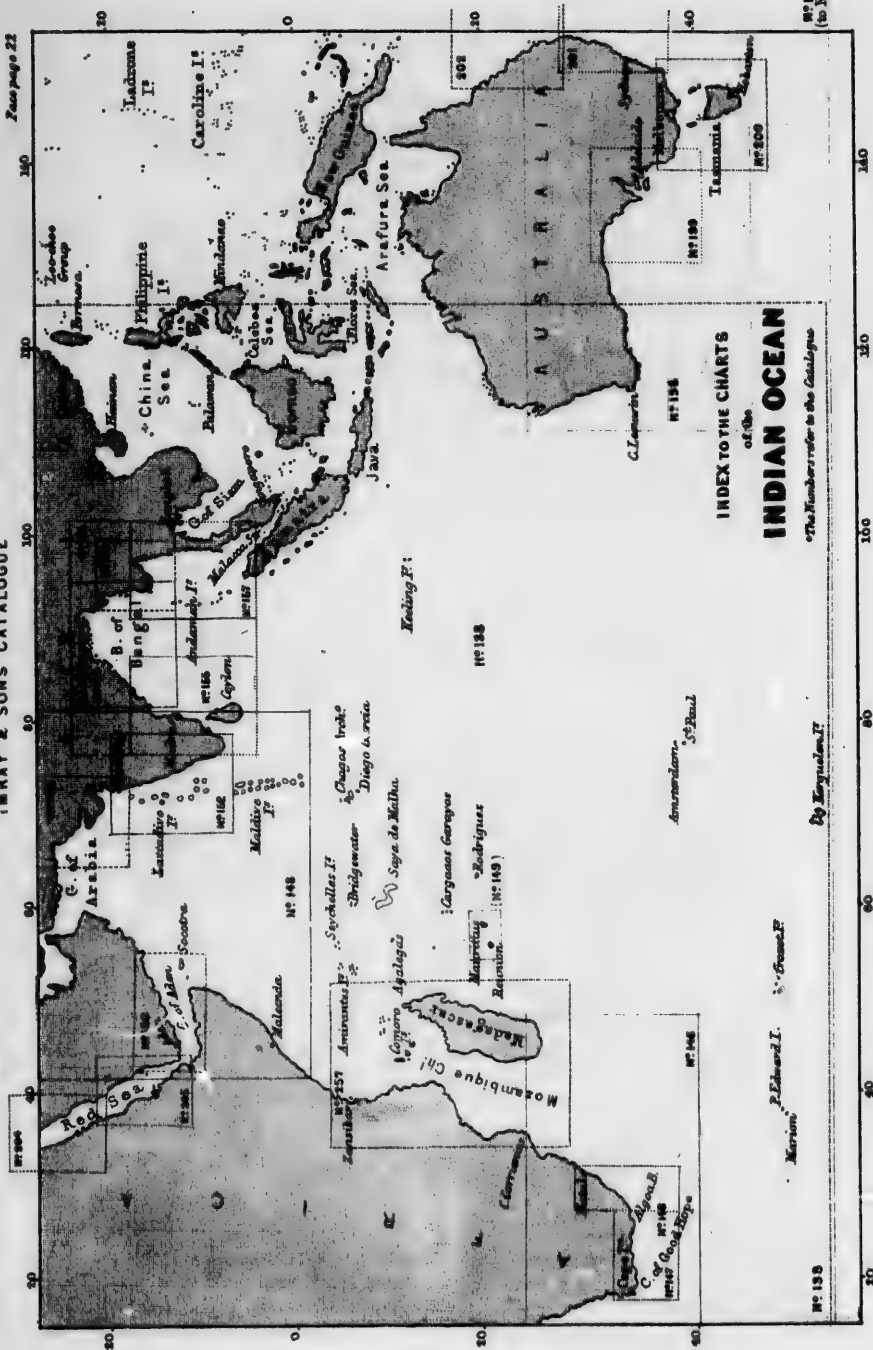
South and East Coasts of Africa.

- 147. COAST of CAPE COLONY (Table Bay to Algoa Bay).** On two large sheets. With plans of Table bay, Knysna harbour, Mossel bay, the coast about Danger point and Dyer island, Cape Agulhas, Plettenberg bay, Great Fish river, False bay, and Simons bay. Compiled from recent British surveys. Illustrated with views of the coast ... 8/-
On cloth for Captains' use ... 10/6
- 148. COAST of CAPE COLONY (Table Bay to Port Natal).** The same chart as No. 147, but with an additional sheet, showing the coast from Great Fish river to Port Natal. It consequently contains all the plans of harbours in that chart, and in addition there are plans of Bird islands, Algoa bay, port Natal, Kowie and Buffalo rivers. Accompanied with a Book of Directions ... 10/-
On cloth for Captains' use ... 13/9
This Chart shows the coast of the Cape Colony on a large scale.
- 146. SOUTHERN AFRICA.** A chart on three sheets showing the navigation round the Cape Colony to Delagoa bay and Mozambique channel. With plans of Table bay, the Breakwater and Docks at Table bay, Mossel bay, port Natal, Delagoa bay, port Nolloth, Hondeklip bay, Saldanha and St. Helena bays, Dassen island, Kowie river, Roodewall bay, McDougall harbour, Simons bay, port Elizabeth (Algoa bay), the Bird islands (Algoa bay), and the coast between the Cape of Good Hope and Struys bay. Limits: latitude 24° S. to 40° S., longitude 16° E. to 46° E. With a Book of Directions... 10/-
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- 257. MOZAMBIQUE CHANNEL.** A large chart on two sheets, showing the east coast of Africa between Delagoa bay and Zanzibar; also the whole of Madagascar, and the intermediate islands. With plans on a large scale of Zanzibar channel, Mozambique harbour, Latham island, and several of the most important anchorages in the Comoro islands. Limits: latitude 27° to 3° 20' S., longitude 38° 30' to 51° 30' E. ... 8/-
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- 256. ZANZIBAR TO THE RED SEA.** With plans of the most important harbours on the coast, comprising Durnford, Mombaza, Kisimayu, Brava, Meurka, Magadoxa, Berbereh, Ras Hafun, Cape Guardafui, south coast of Abd-al-Kuri, and Aden. Limits: lat. 7° 0' S. to 17° 30' N.; long. 38° 30' to 57° 30' E.—the chart consequently includes the Seychelle islands ... 8/-

Charts Nos. 146, 257, 256, are on the same scale, and follow each other. Shipmasters bound from the Cape of Good Hope to Delagoa bay, Mozambique, Zanzibar, or Aden, will find them very useful publications.

Indian Ocean, &c.

- 138. INDIAN OCEAN (Cape of Good Hope to Bombay, Madras, Calcutta, and St. George's Sound, Australia).** The limits of the chart are latitudes 27° N. and 50° S.; longitudes 15° E. and 124° E. On two large sheets. Compiled from recent surveys. Improved by many remarks on the tidal phenomena, currents, winds, &c. ... 8/-
- 139. INDIAN OCEAN.** On three large sheets. The same chart as No. 138, but with an additional sheet (No. 144) containing plans of the principal islands, the Maldivh, Chagos, Seychelle groups, &c. ... 10/-
On cloth for Captains' use ... 13/9
On cloth and rollers for Counting-house, coloured and varnished ... 31/-



140. **INDIAN and PACIFIC OCEANS.** The same chart as No. 138, with the addition of a sheet, to show the coasts of Australia, New Zealand, China, and the Philippine Islands. The limits of the chart are latitudes 27° N. and 50° S.; longitudes 15° E. and 178° E. With a Book of Directions (No. 145) ... 12/-
On cloth for Captain's use ... 15/9
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
141. **INDIAN and PACIFIC OCEANS.** A chart for the use of shipmasters bound to Australia, who may intend to sail on the arc of the Great Circle. In this chart the best routes are laid down, and the Great Circle Tracts from the Cape of Good Hope to Australia are also shown. Limits: latitudes 27° N. to 62° S.; longitudes 15° E. to 178° E. With a Book of Directions (No. 145) ... 14/-
On cloth for Captains' use ... 29/-
142. **INDIAN and PACIFIC OCEANS.** A chart showing the navigation eastward of the Cape of Good Hope to Australia and China, or between latitudes 27° N. and 50° S.; longitudes 15° E. and 178° E. With a sheet of plans of the detached groups of islands so profusely scattered over the Indian Ocean. On four large sheets. With a Book of Directions (No. 145) ... 16/-
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143. **ARABIAN SEA.** A large chart (on two sheets) of the Indian Ocean comprised between the Red Sea, the Gulf of Persia, and the coasts of India and Ceylon. It consequently shows the navigation between Aden, Karachi, Bombay, Colombo, and Point de Galle ... 8/-
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144. **ISLANDS, &c., in the INDIAN OCEAN.** On one sheet. Being the additional sheet referred to in No. 139. The plans are Maldivh, Chagos, Seychelles, and Lakdivh groups of islands; Comoro Islands; Kerguelen Island; St. Paul Island; Cocos Islands; Mahé in Seychelles; and Christmas Harbour in Kerguelen Island. All are on a very large scale ... 5/-
On cloth for Captains' use ... 6/3
145. **Short Notes on the Winds, Weather, and Currents of the Indian Ocean,** together with general Sailing Directions for and Remarks on making Passages; with two charts showing the Currents and Tracks through the Ocean. A pamphlet intended specially to accompany the chart of the Indian Ocean. By W. H. Rosser ... 2/6
267. **ISLANDS EASTWARD OF MADAGASCAR.** Limits: lat. 3° S. to 27° S.; long. 46° to 65° E. With plans of Seychelle islands, Farquhar islands, Tromlin island, Rodriguez, port Victoria (Mahé, Seychelles). Tamatave, Foule point, Fenoarivo (Madagascar). The chart shows the navigation between the Seychelle Islands, Mauritius, Réunion, Rodriguez, and the east coast of Madagascar.
- Note.*—Charts Nos. 146, 257, 266 (page 22 in the Catalogue) and Chart 267 form a series of charts for the navigation of the western part of the Indian Ocean, from the Cape of Good Hope to the Red Sea, and are all on the same scale. They are from the most recent surveys. In connection with them, the Indian Ocean Pilot (see page 33) should be taken.
149. **MAURITIUS AND RÉUNION.** On two large sheets. With plans of port Louis; the north-west coast of Mauritius; the north coast of Mauritius; St. Denis; St. Benoit; St. Rose; St. Gilles; St. Pierre; and St. Paul—briefly, all the important anchorages in each island. Compiled from recent British and French surveys. With a Book of Directions ... 8/-
On cloth for Captains' use ... 10/6
150. **GULF of ADEN (Socotra Island to the Red Sea).** With a plan of Aden. Illustrated with views of the land. On a large sheet. Drawn from recent surveys ... 5/-
- 204.* **RED SEA (North Part).** A large chart on two sheets. With plans of the Strait of Jubal, Tor harbour; Kosair anchorage, Jiddah, the Brothers islets, Suez bay, the harbours of Sherm Wej'h, Sherm Yahar, Sherm Joobbah, Yenbo, Sherm Rabigh, and Sherm Hasseyy ... 8/-

205. * **RED SEA (South Part).** A large chart on two sheets. With plans of the harbours of Lith, Jelajil, Kunfidah, Gizan, Loheyyah, Ras el' Askar, Farisan island, Khor Nohud, Mersa Ar-rakiyah, Kamaran bay, Village bay (Disai island), Sawakin, Khor Nowarat, Hodeidah, Jebel Zukur island, Mokha roadstead, Perim island and harbour, Hamish islands and Bab-el-Mandeb Small strait 8/-
On cloth for Captains' use 10/6

* These charts are on a very large scale. Each contains plans of all the surveyed harbours and anchorages within its limits.

151. **GULF OF SUEZ.** A chart on a large scale of the upper (the northern and most dangerous) part of the Red Sea. It accompanies that of the Suez Canal No. 92, and should be used in conjunction with charts Nos. 227, 92, 204, 205, as these charts show the navigation from the Mediterranean to the Gulf of Aden in a very satisfactory manner 5/-
On cloth for Captains' use 6/3

152. **INDIA (West Coast of), from Cape Comorin to Bombay.** On two large sheets. With plans of Bombay, Tudri river, Vingorla roadstead and rocks, Malwan bay, Chau Kadu reefs, Sedashigur bay, Chitlac island, Kiltan island, St. Mary islands and rocks, Goa and Marmagao roadsteads, Raj-puri river, Narakel anchorage, Kolachel roadstead, Rajapur bay and Viziadurg harbour, Ratnagiri bay, Alipée roadstead, Enciam rocks, Cochin harbour, Calicut roadstead and Beyport river 8/-
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153. **INDIA (West Coast of), from Bombay to Karachi.** On two large sheets. With plans of the harbours of Bombay and Karachi, and of the coast in the vicinity of Karachi 8/-
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154. **BAY of BENGAL.** On two large sheets. With plans of Akyab, Bassein, Trincomalie, Colombo, Point de Galle, Bassas Reefs, &c. &c. With two small charts attached to it, showing the currents during the South-west and North-east monsoons 8/-
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155. * **BAY of BENGAL. (West part of,—Chart No. 1).** On two large sheets. This chart shows the coast from Cape Comorin to Cocanada, and includes Ceylon. With plans of Bassas Reefs, Colombo, Point de Galle, Trincomalie, Madras, Pondichéry, Cocanada, Paumben Pass, &c. &c. Limits of chart, latitudes $4^{\circ} 46'$ to $17^{\circ} 30'$ N.; longitudes $76^{\circ} 30'$ to $86^{\circ} 45'$ E. 8/-
On cloth for Captains' use 10/6

156. * **BAY of BENGAL (North part of,—Chart No. 2).** On two large sheets. This chart comprises the coast between Pulicat and Bassein River. With plans of Akyab, Bassein River, Kyau Phiouk, &c. &c. Limits of chart, latitudes $13^{\circ} 10'$ to 23° N.; longitudes 82° to 95° E. 8/-
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157. * **BAY of BENGAL (East Coast of,—Chart No. 3).** On two large sheets. This chart includes the coast between Bassein River and Penang, the Andamans, Nicobars, north coast of Sumatra, &c. With plans of the principal harbours. Limits of chart, latitudes $4^{\circ} 46'$ to $17^{\circ} 30'$ N.; longitudes 91° to $101^{\circ} 20'$ E. 8/-
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* These three charts (Nos. 155, 156, and 157) include the whole of the Bay of Bengal, and are on a larger scale than any hitherto published. They form an invaluable series of charts for the use of Traders in the Bay.

158. **RICE PORTS of INDIA.** A chart, on two large sheets, of the east coast of the Bay of Bengal, between latitudes 13° and 21° N., longitudes 92° and 98° E. With plans of Akyab, Kyau Phiouk, Bassein River, Rangoon River, Maulmain, and Kalgouk Island anchorage. A very useful chart for shipmasters bound to Akyab, Rangoon, or Maulmain, as it exhibits the navigation on a larger scale than any hitherto published 8/-
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(All these charts of the Bay of Bengal (Nos. 154 to 158) are new publications. The publishers feel confident that better or more useful charts cannot be obtained, as resort has been made to every available official survey, and no expense has been spared in their production.)

159. **BAY OF BENGAL PILOT.** A nautical description of the coasts and islands included within the Bay of Bengal. Intended to accompany the charts of the Bay. With plans of many of the most important harbours. This work contains the official instructions for making and entering the various harbours. By James F. Inray, F.R.G.S. ... 8/-

East India Archipelago.

160. **EAST INDIA ARCHIPELAGO**, on two sheets. Being a general chart of all the islands composing the Archipelago of the India and China Seas. A track chart, and not intended for navigation purposes; the scale being too limited for insertion of the Reefs with the necessary accuracy. ... 8/-
On cloth for Captains' use ... 10/6
- 161.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 1). Limits, latitudes $2^{\circ} 50'$ and $7^{\circ} 10' S.$, and longitudes $105^{\circ} 30'$ and $110^{\circ} 50' E.$... 7/6
- 162.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 2). Its limits are, latitudes $3^{\circ} 0' S.$, and $5^{\circ} 40' N.$, and longitudes $103^{\circ} 20'$, and $110^{\circ} 20' E.$... 7/6
- 163.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 3). Limits, latitudes $3^{\circ} N.$ to $16^{\circ} 20' N.$, and longitudes $99^{\circ} 20'$ to $110^{\circ} E.$... 7/6
- 164.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 4). Limits, latitudes $1^{\circ} 20'$ to $11^{\circ} 52' N.$, and longitudes $107^{\circ} 20'$ to $120^{\circ} 40' E.$... 7/6
- 165.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 5). Limits, latitudes $10^{\circ} 50'$ and $23^{\circ} 40' N.$, and longitudes $104^{\circ} 45'$, and $115^{\circ} 20' E.$... 7/6
- 166.* **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 6). Limits, latitudes $10^{\circ} 50'$ and $23^{\circ} 40' N.$, and longitudes $112^{\circ} 10'$, and $122^{\circ} 45' E.$... 7/6

* These charts (Nos. 161 to 166) of what is popularly known as the Western Route to China, exhibit the navigation from Sunda Strait to the Coast of China on a very large scale. Each consists of two sheets; the set, therefore, comprises twelve sheets. They have been compiled from the most recent British, French, Dutch, and Spanish surveys. In several of the charts there are notes descriptive of the currents, winds, &c., and remarks upon the courses most advisable to follow at certain periods of the year. If mounted on cloth for Captains' use, the price of each will be ss. 6d. extra. An Index Chart accompanies the set.

167. **STRAITS of MALACCA and SINGAPORE.** On two large sheets. With plans of Singapore Strait, Singapore Harbour, Penang Island, Strait of Durian, &c. Drawn from recent British surveys ... 8/-
On cloth for Captains' use ... 10/6
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224. **BANKA STRAIT.** A large chart on two sheets. With plans of Lucipara channel, Nangka islands and anchorage, and Mintok roadstead ... 8/-
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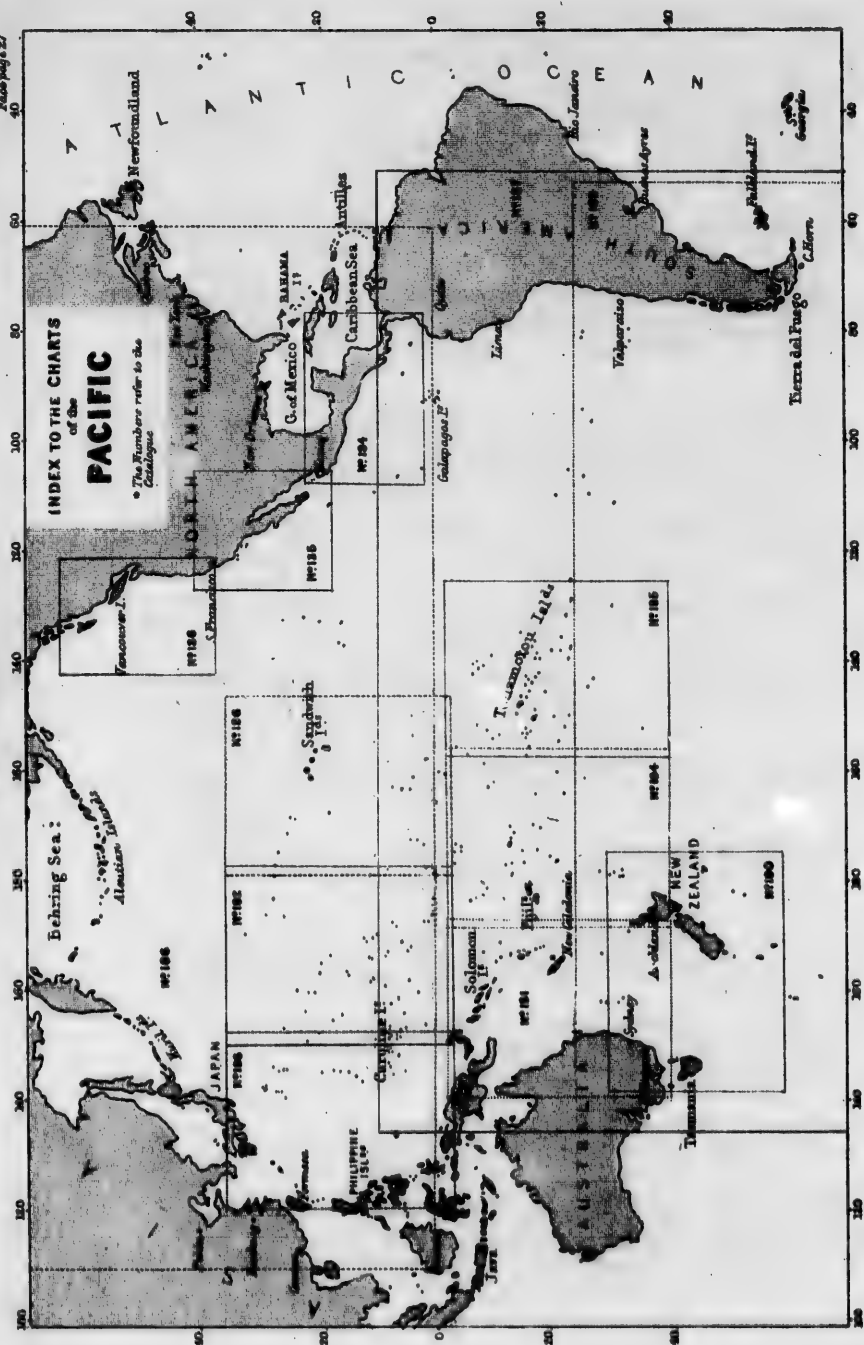
235. **KARIMATA STRAIT.** A large chart on two sheets. From recent Dutch surveys ... 8/-
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208. **EAST INDIA ARCHIPELAGO** (Western Route to China,—Chart No. 6); with an additional sheet to show the coast of China as far northward as Amoy. Limits, latitudes $10^{\circ} 50'$ and $26^{\circ} 40'$ N., and longitudes $112^{\circ} 10'$ to $122^{\circ} 45'$ E. ... 10/-
209. **JAVA, LOMBOK, SUMBAYA, and CELEBES.** Showing the navigation between Sunda, Banka, Gaspar, and Karimata Straits, and Makassar at the south-west end of Celebes. Being the same chart as No. 171, but with an additional sheet to include Sunda and Banka Straits. On three large sheets ... 12/-
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- 171.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 1). This chart with No. 161 (the Western Route to China, Chart No. 1) exhibits the navigation of the Indian Archipelago eastward of Sunda Strait, so far as Makassar Strait. Its limits are latitudes $2^{\circ} 30'$ and $12^{\circ} 20'$ S., and longitudes $110^{\circ} 10'$ and $122^{\circ} 20'$ E. ... 7/6
- 172.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 2), showing the Banda Sea and great island of Timor, Pitts Passage, &c. Limits, latitudes $2^{\circ} 30'$ and $12^{\circ} 20'$ S., and longitudes $121^{\circ} 30'$ and $133^{\circ} 40'$ E. ... 7/6
- 173.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 3), showing the Arafura Sea, Torres Strait, &c. Limits, latitudes $2^{\circ} 30'$ and $12^{\circ} 20'$ S., and longitudes 133° and $145^{\circ} 15'$ E. ... 7/6
- 174.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 4). This chart shows the sea northward of Chart No. 1, and includes Makassar Strait, Celebes Sea, &c. Limits, latitudes $3^{\circ} 20'$ S. and $8^{\circ} 40'$ N., and longitudes $116^{\circ} 10'$ and $125^{\circ} 50'$ E. ... 7/6
- 175.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 5), showing the Molucca Islands and south part of the Philippines. Limits, latitudes $3^{\circ} 20'$ S. and $8^{\circ} 40'$ N., and longitudes 125° and $134^{\circ} 40'$ E. ... 7/6
- 176.* **EAST INDIA ARCHIPELAGO** (Eastern Passages to China and Japan,—Chart No. 6), showing the greater part of the Philippines, the Sulu Sea, &c. Limits, latitudes 8° and $17^{\circ} 40'$ N., and longitudes $118^{\circ} 20'$ and $130^{\circ} 20'$ E. ... 7/6
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The following are some of the special advantages found in using the Taffrail Log.

FIRST. The dial of the Log can be easily inspected at all times, which is particularly convenient when changing the course of the vessel, the necessity of hauling in being avoided.

SECOND. The register is secured on board, and consequently is easily accessible. The rotator only is overboard. The strain upon the line is about one-quarter of that of the submerged Log, which is variously estimated at forty or fifty pounds, sufficient to decrease the speed of the vessel to some extent: besides, the greater strain often causes the breakage of the line and the loss of the entire Log.

THIRD. This Log will be found, ultimately, the cheapest, because only the rotator is exposed to danger of loss, and when lost, can be replaced at trifling cost.

FOURTH. The substantial manner in which these Logs are made, and the fact that the registering apparatus is not exposed to the action of salt water, may be taken as a guarantee that they will last far longer than is possible with any submerged Log.

FIFTH. The liability of having the Log ruined, or at least disabled, when crossing shoals, by striking the bottom, or being filled with sand, is avoided.

SIXTH. The state of the Log being readily seen, prevents the danger of over-running a given distance when on any course.

SEVENTH. Fouling with sea weed is avoided by the gradual taper of the blades, and the freedom from obstructions, such as knots or eyes.

EIGHTH. This Log will indicate accurately, at a lower speed than any submerged Log, because there is less slip, owing to the spiral form of the blades of the rotator.

NINTH. The greater part of the damage caused by hauling in is avoided in this Log, as that is so seldom required: besides, the blades being spiral are much stronger.

Price (complete with line)	£4 10 0
Rotator (if sold separately)	0 15 0

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	£	s.	d.
Bliss & Co.'s (New York) Taffrail Log	4	10	0
Walker's Taffrail	4	10	0
Massey's	3	10	0
" Propeller Log	3	3	0
Reynolds' Pendant Log	3	3	0
" Odometer (a self-registering Log, with the apparatus fixed on the quarter rail of the Ship—the vane or rotator only being thrown overboard)	5	5	0

PATENT LIQUID COMPASS.

The Card or Dial consists of a metal plate floated, by means of air-vessels, in liquid; it is perfectly steady under any amount of vibration, or pitching, or rolling of the Vessel, and at the same time is as quick in its action as the lightest compass; and it is guaranteed to remain so on the longest voyage; it is equally as sensitive in fine weather as in heavy, and, although especially applicable to steamers, in which the vibration has heretofore been a great detriment in ascertaining the true course made, it is no less useful in a sailing vessel.—For steam-boats it is superior to all other Compasses in use. Size of Card, 6, 7½, 9, and 10 inches from £4 10s.

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